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PLANT 4

HANDBOOK OF OPERATING INSTRUCTIONS

MICROWAVE SPECTRUM ANALYZER MODEL TSA-W and TSA-WF

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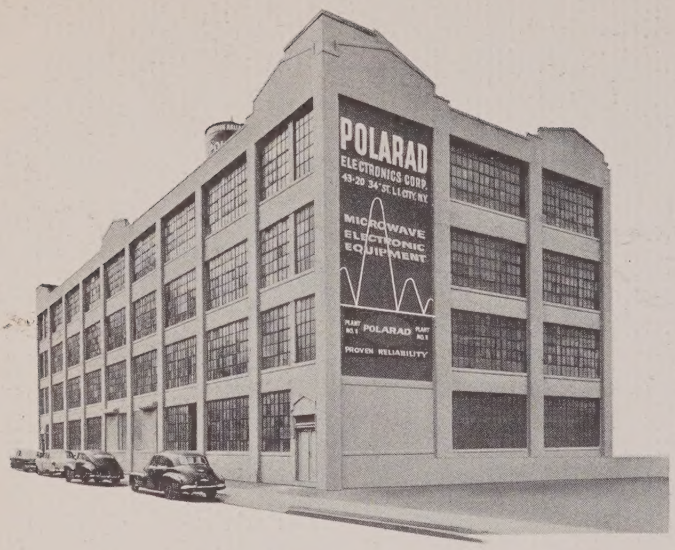

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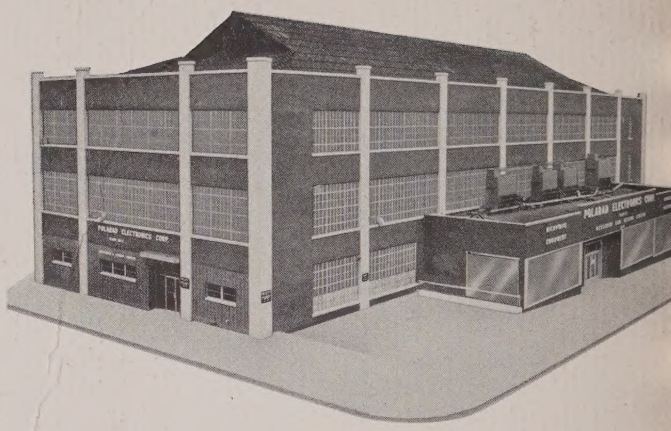

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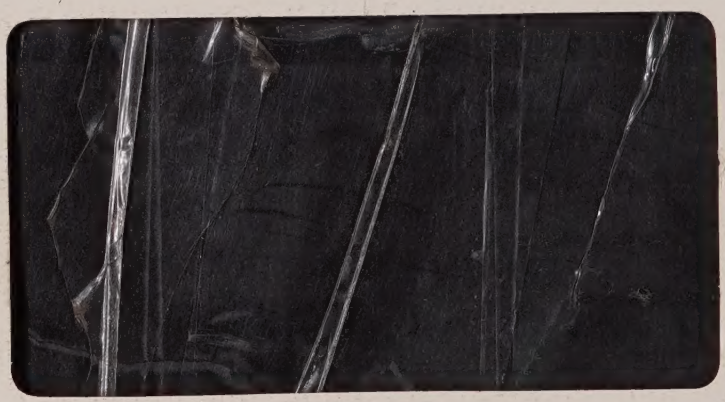

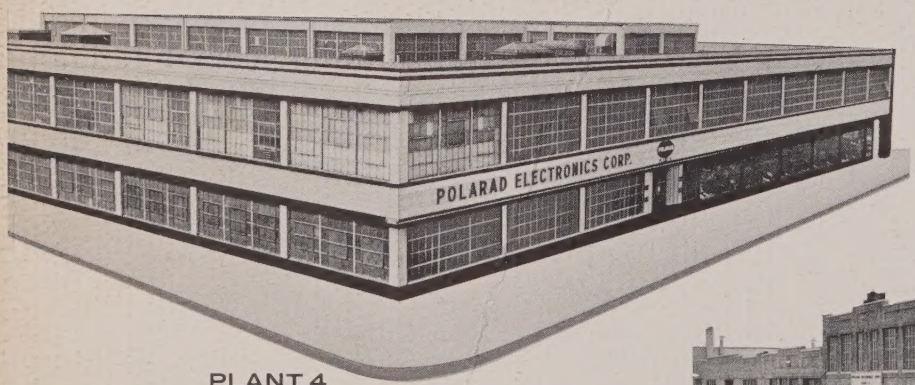

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PLANT 4

INSTRUCTION MANUAL

MICROWAVE
SPECTRUM ANALYZER
MODEL
TSA-W and TSA-WF

POLARAD ELECTRONICS CORPORATION • 43-20 34th St., Long Island City 1, N. Y.

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Polarad Electronics Corporation warrants each instrument of its manufacture to be free from defects in material and workmanship. Our obligation under this Warranty is limited to servicing or adjusting any instrument returned to our factory for that purpose, and to making good at our factory any part or parts thereof except tubes, fuses or batteries, which shall, within one year after making delivery to the original purchaser, be returned to us with transportation charges prepaid, and which on our examination shall disclose to our satisfaction to have been thus defective.

Polarad Electronics Corporation reserves the right to make changes in design at any time without incurring any obligation to install same on units previously purchased.

This Warranty is expressly in lieu of all other obligations or liabilities on the part of the Polarad Electronics Corporation, and Polarad neither assumes nor authorizes any other person to assume for them any other liability in connection with the Sales of Polarad's instruments.

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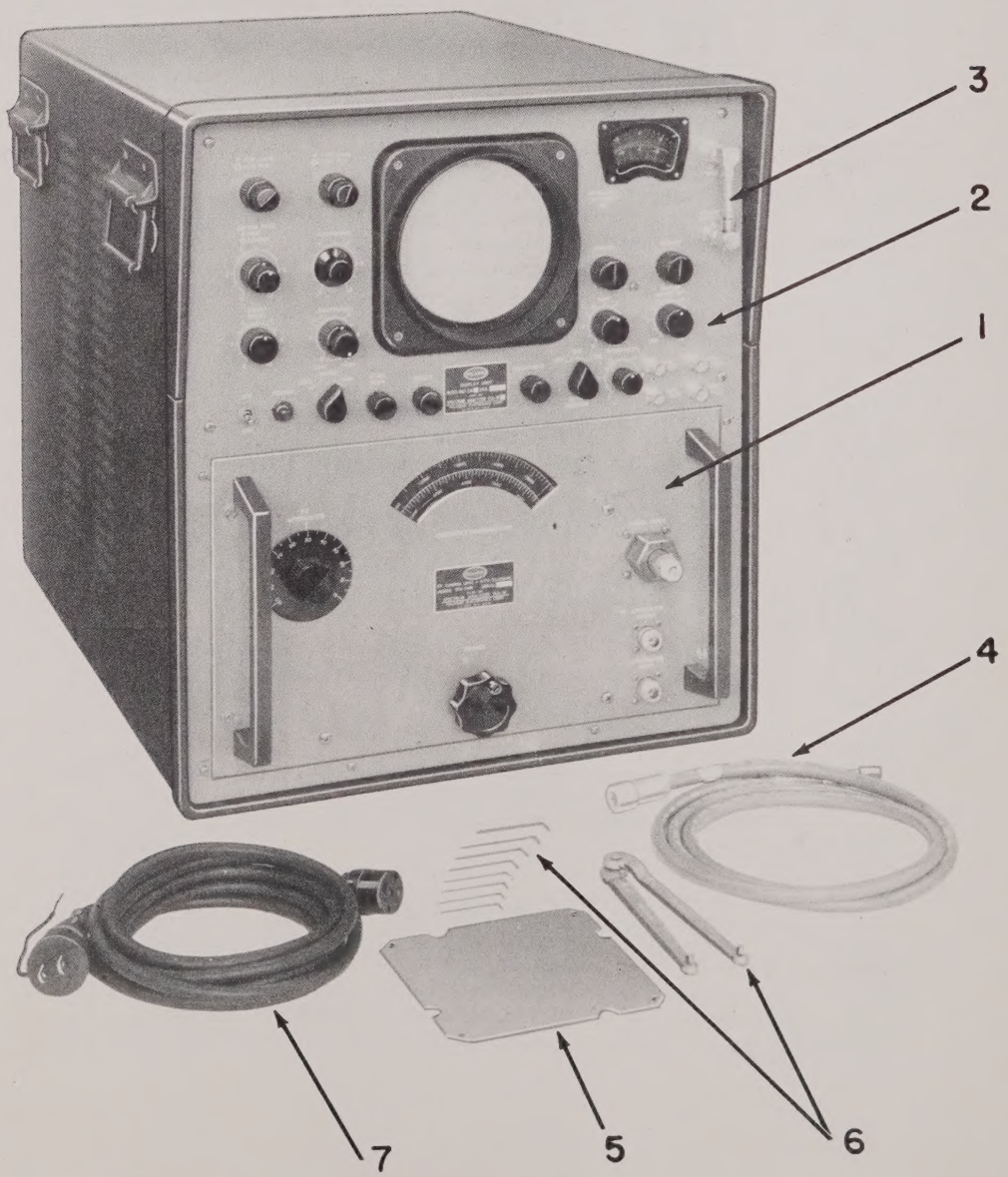


Figure 1-1. Model TSA-W Spectrum Analyzer and Accessories

SECTION I

INTRODUCTION

1-1. SCOPE OF MANUAL.

1-2. This manual contains instructions for the installation, operation and maintenance of the Polarad Wide Dispersion Spectrum Analyzer, Models TSA-W and TSA-WF. The Models TSA-W and TSA-WF are identical except that the Model TSA-WF is designed to operate at a power line frequency between 50 and 1,000 cps. The Model TSA-W is described in this manual and this information also applies to the TSA-WF unless otherwise noted. The Models TSA-W and TSA-WF are designed and manufactured by Polarad Electronics Corporation, Long Island City 1, New York.

1-3. PURPOSE OF EQUIPMENT.

1-4. The Polarad Wide Dispersion Spectrum Analyzer, Model TSA-W, is a precision instrument for presenting the spectral display of signal energy in the frequency range from 10 to 44,000 mc. The spectral display appears on the screen of a cathode-ray tube with the frequency of the applied signal being displayed on the X axis, while the amplitude of the frequency is displayed on the Y axis. Some specific uses of the Model TSA-W are:

a. Observing and measuring AM and FM signal side bands.

b. Measuring the frequency of radio and/or radar signals.

c. Determining the type of modulation in radio and/or radar signals.

d. Checking the tracking of radar system r-f components.

e. Displaying the power spectrum of r-f pulses.

f. Checking the spectrum of pulsed magnetron oscillators.

g. Measuring noise spectra.

h. Measuring frequency.

i. Checking frequency relationship of multi-frequency transmitters.

j. Measuring parasitic oscillation.

k. Checking transmitters or signal generators for continuous output throughout the tuning range.

l. Checking oscillator frequency drift.

m. Locating the sources of r-f leaks.

1-5. GENERAL DESCRIPTION.

1-6. The Model TSA-W is essentially a superheterodyne receiver using four converters and working into a cathode-ray tube display. It consists of the basic unit Model DU-2A and one of the five plug-in RF Tuning Units, Models STU-1WA, STU-2WA, STU-3WA, STU-4WA and STU-5WA. The tuning units cover a frequency range from 10 to 44,000 mc. The basic unit consists of a wide band i-f amplifier, narrow band i-f amplifier, variable bandwidth i-f amplifier, variable frequency marker oscillator, sweep frequency generator, and video chassis. The video chassis contains a logarithmic amplifier, vertical and horizontal amplifiers, blanking and intensifier amplifier, and the phantastron sweep generator. Four electronically regulated power supplies and one unregulated supply provide the necessary operating voltages. Each of the five tuning units contains a local oscillator, a crystal mixer, and a precision UNIDIAL® drive mechanism for simultaneous tracking of the local oscillator with tuning dial rotation. Special shielding is provided to minimize leakage radiation and to permit satisfactory operation in the presence of high power transmitters. The Model TSA-W is furnished either in a cabinet for bench or cart use, or with brackets for rack mounting.

1-7. EQUIPMENT SUPPLIED.

1-8. Table 1-1 lists the equipment which comprises the Model TSA-W. Optional accessories are listed in table 1-2.

TABLE 1-1. EQUIPMENT SUPPLIED

Figure 1-1 Index No.	Component	Polarad Model or Part No.	Over-all Dimensions (inches) (Unless otherwise indicated)	Weight (lbs.)
1	RF Tuning Unit	STU-1WA, STU-2WA, STU-3WA, STU-4WA, or STU-5WA	HxWxD	
2	Model TSA-W Basic Unit	DU-2A	20-1/2 x 18-3/4 x 25-3/4	135
3	I-F Cable Assembly W80	A135336	4 in. long	
4	AC Power Cord W71 with Adapter CP1	B111144, A131966	10 ft. long	1.06
5	Amber CRT Filter H1	B27336-1		0.25
6	Wrench Kit	A25109		0.75
7	R-F Cable Assembly W72	BP12551	6 ft. long	0.75
	Plastic Bag		16 x 12-1/2	
	Instruction Manual			
	Handbook of Spectrum Analyzer Techniques			

TABLE 1-2. OPTIONAL ACCESSORIES

Name	Function
RF Tuning Units Models STU-1WA, STU-2WA, STU-3WA, STU-4WA, and STU-5WA.	Additional tuning units increase the frequency range of the basic TSA-W Spectrum Analyzer
RF Tuning Unit Dust Cover.	Used to store tuning units when they are not installed in basic unit Model DU-2A
Model DA-4 Instrument Dolly.	Conserves bench space and makes cabinet mounted unit more portable.
Model SB-2 Brackets.	For rack mounting unit with panel flush with rack.
Model SB-3 Brackets.	For rack mounting unit with panel protruding from rack.

1-9. TECHNICAL CHARACTERISTICS.

1-10. The technical characteristics of the Model TSA-W are listed below. Unless otherwise stated all values are nominal.

DISPLAY AND POWER SUPPLY UNIT MODEL DU-2A:

Shielding attenuation	Greater than 100 db.
Spectral display	Signal amplitude on vertical axis (log or linear), versus frequency on horizontal axis.
Logarithmic display	3 db per graticule division to 24 db.
Variable bandwidth	1 kc to 80 kc, continuously variable.
Sweep Frequency Rate	1 to 30 cps, adjustable.
Frequency dispersion:	
Below 55 mc	60 kc to 5 mc.
55 mc to 1,000 mc	60 kc to 25 mc.
1,000 to 44,000 mc	60 kc to 80 mc in two bands: 60 kc to 10 mc and 1 mc to 80 mc.
I-F Attenuation range	0 to 40 db, continuously variable.
Internal marker	Variable marker calibration ±40 mc in frequency difference from 160 mc. Adjustable amplitude.
Synchronization	External, free-running or line frequency.
Maximum power input	250 milliwatts.
Cathode-ray tube	5 inch flat face with edge lighting on graticule and camera mounting facilities on bezel.
Power requirements	
Model TSA-W	115/230 vac ±10% 50/60 cps, 500 watts
Model TSA-WF	115/230 vac ±10% 50 cps to 1,000 cps, 500 watts.

RF TUNING UNITS:

Model	Frequency Range (mc)	Sensitivity* (-dbm)	RF Attenuator Range
STU-1WA	10 to 400	90 to 100	0 to 100 db
	350 to 1,000	90 to 95	0 to 100 db
STU-2WA	910 to 2,200	85 to 95	0 to 100 db
	1,980 to 4,560	75 to 87	0 to 100 db
STU-3WA	4,370 to 11,000	77 to 90	0 to 100 db
	8,900 to 22,000	65 to 85	below 12 kmc
STU-4WA	21,000 to 33,000	57 to 75	external attenuator
STU-5WA	33,000 to 44,000	50 to 65	external attenuator

*Sensitivity is signal + noise = twice noise at minimum dispersion and resolution

Frequency dial accuracy	±1% of dial readings except for Model STU-1WA which is ±1% of local oscillator frequency.

1-11. ELECTRON TUBE, SEMICONDUCTOR, FUSE AND INDICATOR LAMP COMPLEMENTS.

1-12. Tables 1-3 through 1-8 list the electron tube, semiconductor, fuse and indicator lamp complements respectively.

TABLE 1-3. MODEL DU-2A DISPLAY CHASSIS, ELECTRON TUBE COMPLEMENT

Quantity	Type No.
5	OA2
2	1Z2
1	5ADP7
2	5R4
1	6AG5
2	6AK5
2	6AN8
1	6AR6
1	6005
1	6AS6
2	6BE6
2	12AT7
3	12AU7
4	12AX7
2	807
1	5651
4	5718
1	5881
3	6080
4	6922/6D38 (selected)
4	6AH6

TABLE 1-4. TUNING UNITS, ELECTRON TUBE COMPLEMENT

Quantity	Type No.	Tuning Unit Model No.
1	6AF4A	STU-1WA
1	ZV1009, 6BM6 or 5837	STU-2WA
1	6X4	STU-2WA
1	5721	STU-3WA
1	6X4	STU-3WA
1	5721	STU-4WA
1	6X4	STU-4WA
1	5721	STU-5WA
1	6X4	STU-5WA

TABLE 1-5. MODEL DU-2A DISPLAY CHASSIS, SEMICONDUCTOR COMPLEMENT

Quantity	Polarad Drawing or Type No.
2	1N69
1	1N82A
7	1N198
2	40K
1	2N277
1	1N2970A
1	1N1341
1	A27794
12	B707117

TABLE 1-6. TUNING UNITS, SEMICONDUCTOR COMPLEMENT

Quantity	Type No.	Tuning Unit Model No.
1	PADT30	STU-1WA
1	1N21C	STU-1WA
1	1N21B or 1N23C	STU-2WA
1	1N26 or 1N78	STU-3WA
1	1N26	STU-4WA
1	1N53	STU-5WA

TABLE 1-7. FUSE COMPLEMENT

Quantity	Type	Rating
1	MDL-4 Bussmann	4A, 250V
1	MS90078-26	2A, 250V
2	MDL-6.25 Bussmann	6.25A

TABLE 1-8. INDICATOR LAMP COMPLEMENT

Quantity	Type No.	Use
1	328	Power Indicator
4	47	Scale Illuminators

SECTION II

OPERATION

2-1. INSPECTION.

2-2. Before installing or operating the Model TSA-W inspect for possible damage incurred during shipment. Check that the equipment is complete as listed on the packing slip or check it against the tables of components in paragraph 1-7. After the equipment has been checked for completeness, inspect it as follows:

a. Examine exterior surface for dents or scratches.

b. Examine handles, latches, and fasteners for tightness and ease of operation.

c. Operate control knobs which should turn freely, index at panel markings and be tight on their shafts.

d. Examine dials and indicators for legibility.

e. Operate switches which should set readily.

f. Examine electron tubes for proper seating and for presence of shields and clamps.

2-3. EQUIPMENT INSTALLATION.

2-4. After inspecting the equipment plan its installation. The Model TSA-W is supplied mounted in a cabinet for bench or cart use or ready for one of two types of rack mountings.

a. Figure 2-1 illustrates the Model TSA-W installed in a cabinet.

b. Figure 2-2 illustrates the installation of a rack mounted unit with protruding panel.

c. Figure 2-3 illustrates the installation of a rack mounted unit with flush panel.

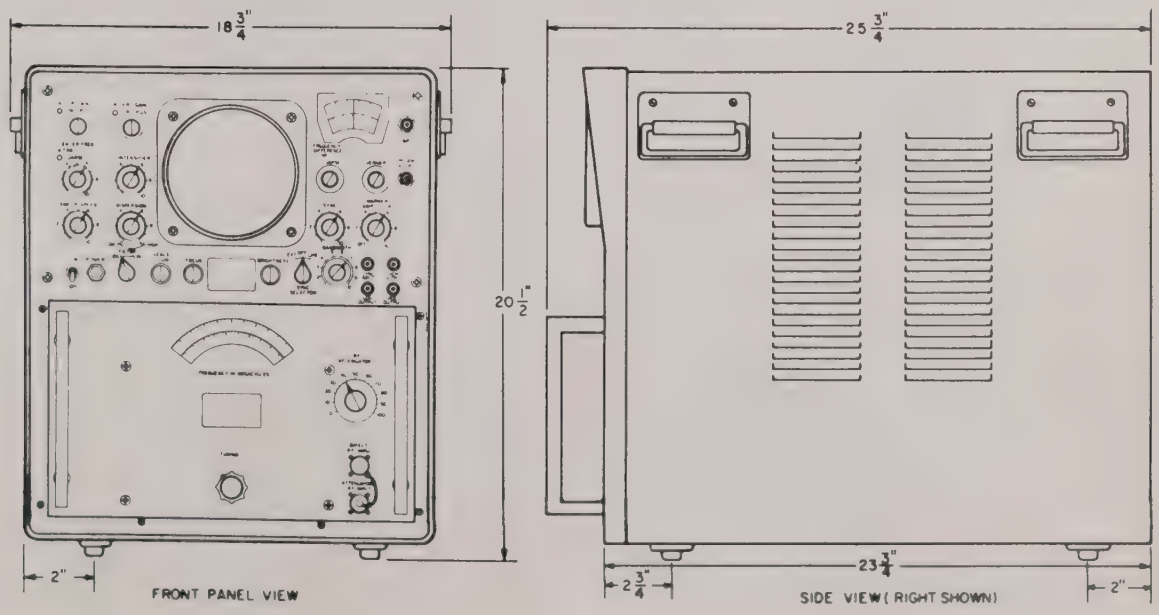


Figure 2-1. Outline Installation Drawing, Cabinet Mounted Unit

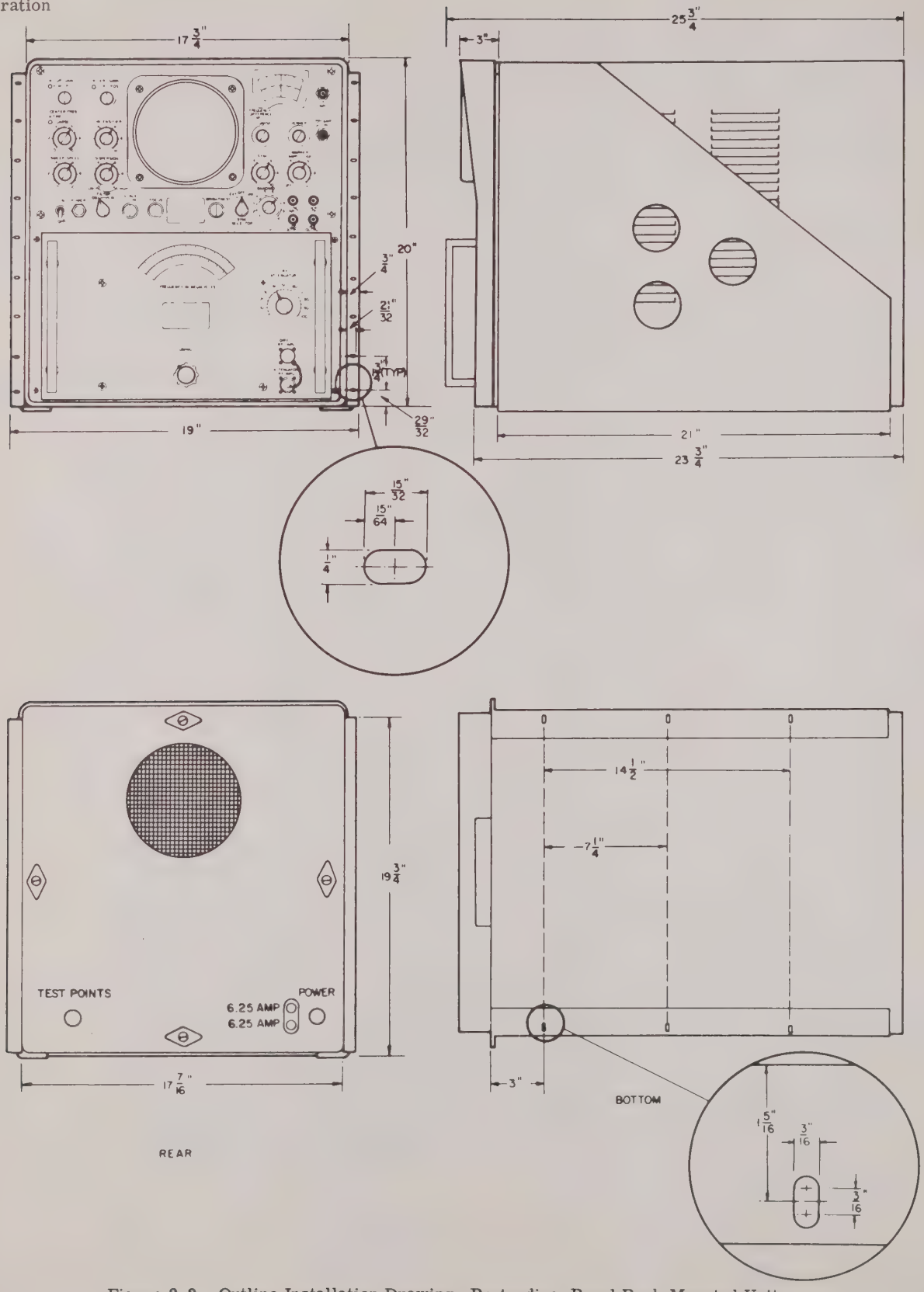


Figure 2-2. Outline Installation Drawing, Protruding-Panel Rack Mounted Unit

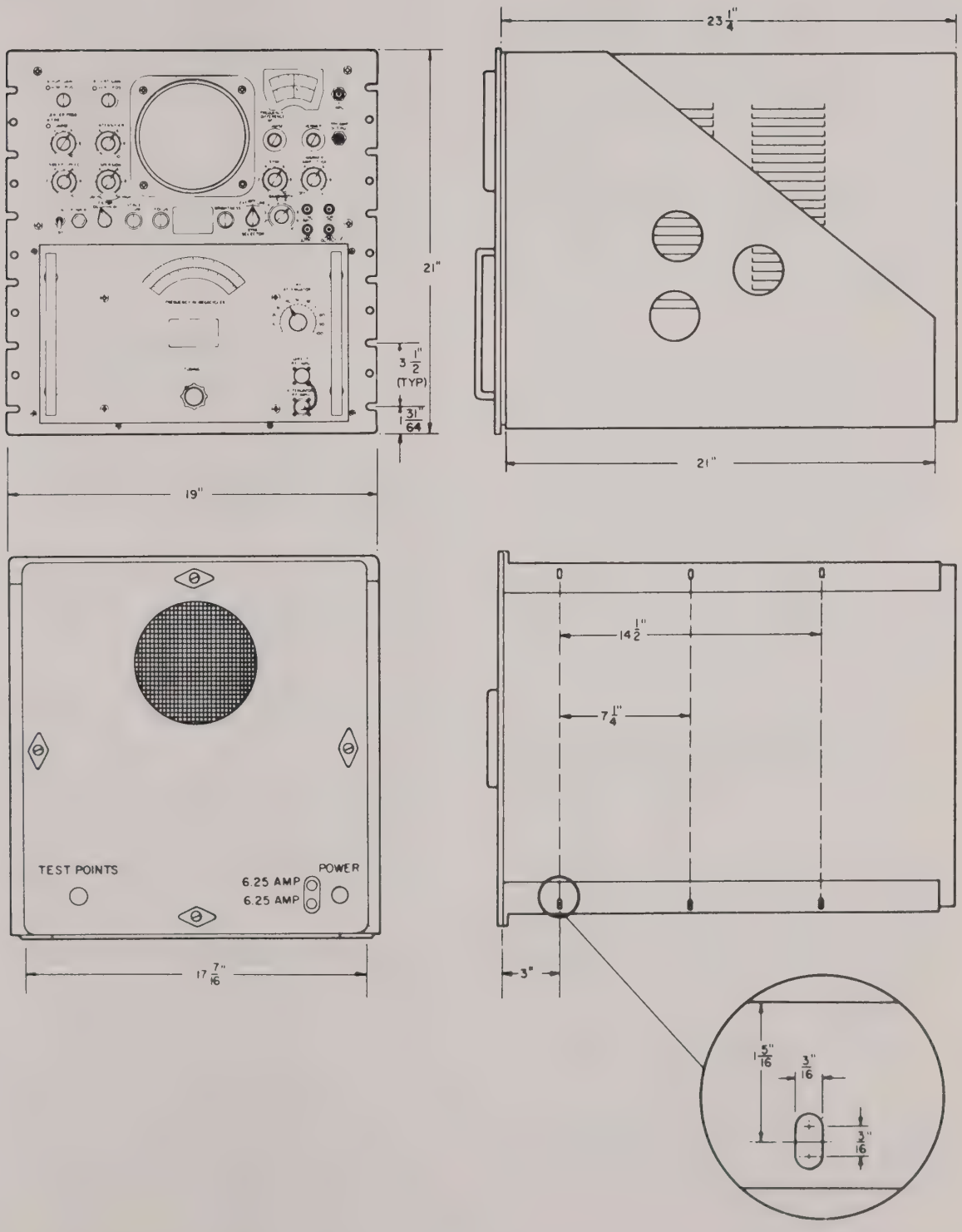


Figure 2-3. Outline Installation Drawing, Flush-Panel Rack Mounted Unit

When the Model TSA-W is to be used mounted in a cabinet, consider the use of instrument Dolly DA-4 for conserving bench space. If either of the rack mountings is to be used, select a position in the rack that will provide maximum accessibility and adequate ventilation.

2-5. CONTROLS, INDICATORS, AND CONNECTORS.

2-6. The operating controls, indicators and connectors of Model TSA-W are listed in table 2-1 and shown in figure 2-4. Haphazard operation or improper settings may cause damage to electronic equipment. For this reason, it is important to know the function of every control.

2-7. SPECTRUM ANALYZER MODEL TSA-W OPERATION.

2-8. PRELIMINARY OPERATING PROCEDURE. The procedure noted below is to be followed prior to making specific measurements with the TSA-W.

a. Before applying power to the Model TSA-W, the position of the line-voltage selector switch (115V/230V), located at the rear of the display chassis, must be checked (see figure 4-4). This requires that the chassis be removed from the cabinet. To do this, proceed as follows:

(1) Set the Model TSA-W on a bench so that the rear of the cabinet is accessible.

(2) Turn the four cam-lock screws located on the rear of the cabinet in a clockwise direction until they are loose.

(3) Slide the display chassis out of the cabinet.

(4) Set the line-voltage selector switch to the position desired for either 115-volt or 230-volt operation. When this switch is in the 115-volt factory set position, power is applied to both primary windings of T101, T102 and T103 in parallel. When it is changed to the 230-volt position, these same windings are placed in series.

CAUTION

THE 115/230 VOLT SWITCH IS FACTORY SET FOR 115-VOLT OPERATION. DAMAGE TO THE POWER SUPPLY COMPONENTS WILL RESULT IF 230 VOLTS ARE APPLIED TO THE TSA-W WHILE THE SWITCH IS IN THE 115-VOLT POSITION.

(5) Slide the display chassis back into the cabinet.

(6) Turn the four cam-lock screws in a clockwise direction until the chassis is locked in place.

CAUTION

USE CARE WHEN REMOVING AND REPLACING THE INSTRUMENT. DO NOT USE FORCE TO GET IT INTO OR OUT OF THE CABINET.

b. Connect a nominal 115/230 volt, 50 to 60 cps power source (50 to 1000 cps for the TSA-WF) to the power input receptacle J127 (located at the bottom rear of the Display Unit) via Electrical Power Cable Assembly W71 and Power Cable Adapter CP1.

WARNING

APPLICATION OF POWER TO THIS EQUIPMENT RESULTS IN VERY HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OBSERVE ALL SAFETY PRECAUTIONS AT ALL TIMES.

c. Turn the power ON-OFF switch to the ON position. The POWER pilot lamp will become illuminated, indicating that line power is being applied to the primaries of the power transformers in the low-voltage power supply.

d. Allow a fifteen-minute warm-up period for the local oscillator (located in the Tuning Unit) to stabilize.

e. Connect I-F Cable Assembly W80 as a jumper between the PREAMP OUTPUT jack and the IF INPUT jack.

f. Adjust the HOR GAIN, HOR POS, FOCUS and BRIGHTNESS controls to obtain a sharp base line on the crt screen.

g. Adjust the VERT POS control to locate the base line on the crt screen directly below the lowest horizontal line etched on the crt graticule.

h. Set the DISPERSION switch to the HIGH position.

i. Rotate the DISPERSION control fully clockwise.

j. Set LOG-FILTER-LIN switch in LIN position.

k. Rotate BANDWIDTH control maximum clockwise.

l. Rotate the VERT GAIN control fully clockwise.

m. Rotate the MARKER AMPLITUDE control fully clockwise.

TABLE 2-1. OPERATING CONTROLS, INDICATORS AND CONNECTORS

Figure 2-4 Index No.	Front Panel Designation	Function
1	HOR GAIN and HOR POS controls	The GAIN control permits the varying of the width of the horizontal display on the crt. The POS control permits the display on the crt to be shifted either to the left or to the right.
2	INTENSIFIER control	Permits the adjustment of the intensity of the signal portion of the display only.
3	VERT GAIN and VERT POS controls	The POS control permits the display on the crt to be shifted either up or down. The GAIN control permits the adjustment of the height of the vertical display on the crt.
4	BRIGHTNESS control	Varies the brightness of the trace on the crt.
5	SYNC control	Permits the adjustment of the synchronizing voltage, permitting the phantastron generator to lock at sub-multiples of the line frequency.
6	FREQUENCY DIFFERENCE MC dial and COARSE and VERNIER controls	Rotation of the COARSE and VERNIER controls permits the location of the marker pip within ±40 mc of the i-f bandpass center frequency. Variation from the i-f bandpass center frequency is indicated on the FREQUENCY DIFFERENCE MC dial.
7	IF INPUT jack	Provided for applying either the output of the tuning unit or an external test signal to the display unit circuitry.
8	PREAMP OUTPUT jack	Provided for access to the output of the tuning unit. It also permits the use of the Polarad Model SD-1 Multipulse Spectrum Selector, which makes it possible for the TSA-W to analyze individual pulses in a pulse group.
9	MARKER AMPLITUDE control	This control, when rotated clockwise beyond its OFF position, permits the adjustment of the height of the marker pip on the crt.
10	BANDWIDTH control	Permits the varying of the resolution bandwidth from 1 to 80 kc.
11	SYNC INPUT jack	Provided for the application of an external synchronizing signal (with the SYNC SELECTOR switch in the EXT position) to the phantastron generator.
12	HOR OUTPUT jack	Provides output for external use of the horizontal sawtooth voltage.
13	VIDEO OUTPUT jack	Provides output for remote viewing of the video signal.

(Cont'd)

TABLE 2-1. OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont'd)

Figure 2-4 Index No.	Front Panel Designation	Function
14	LOG OUTPUT jack	Provides output for external use of a logarithmic signal.
15	SYNC SELECTOR switch	Permits the selection of either internal or external synchronization of the phantastron generator. When in the OFF position, the phantastron generator is free-running.
16	RF ATTENUATOR control	Permits the attenuation of the incoming r-f signals which are applied to the ATTENUATOR RF INPUT jack. The attenuation inserted by this control is variable between 0 and 100 db for use up to 12.4 KMC.
17	DIRECT RF INPUT jack	Provided for the direct application of incoming r-f signals. This connection utilizes the maximum sensitivity of the TSA-W.
18	ATTENUATOR RF INPUT jack	Provided for the connection of the incoming r-f signals to the RF ATTENUATOR for use up to 12.4 KMC.
19	TUNING control	Adjusts the frequency of the signal displayed on the crt.
20	SCALE ILLUM control	Controls the illumination of the crt graticule.
21	LOG-FILTER-LIN switch	Permits the selection of logarithmic, logarithmic-filter, linear-filter or linear vertical deflection on the cathode-ray tube. The filter positions introduce a video filter in the circuitry.
22	POWER pilot lamp	Indicates that TSA-W has been energized.
23	Power ON-OFF switch	Energizes the TSA-W by controlling application of primary power.
24	FOCUS control	Adjusts the sharpness of the CRT display.
25	SWEEP SPEED control	Permits control of the sweep repetition rate, which can be varied from 1 to 30 cps.
26	CENTER FREQUENCY COARSE and FINE controls	Permit adjustment of the center frequency of the sweep-frequency generator to position the display at the electrical center of the crt.
27	DISPERSION HIGH-LOW switch and DISPERSION control	The switch selects the dispersion range: LOW - 60 kc to 10 mc HIGH - 1 mc to 80 mc. The control varies the dispersion within the range selected.

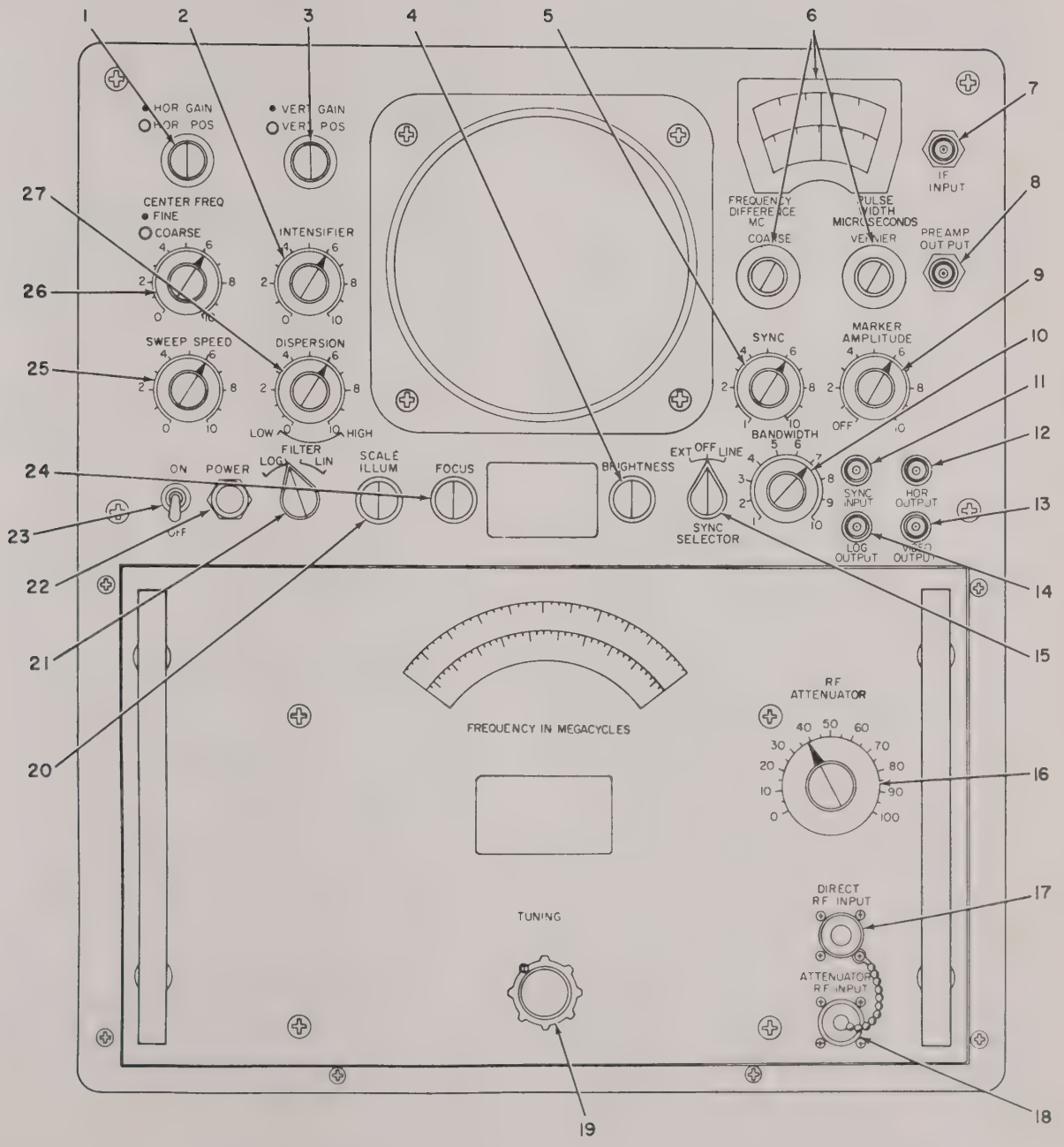


Figure 2-4. Operating Controls, Indicators and Connectors

n. Rotate the COARSE and VERNIER controls to line up the FREQUENCY DIFFERENCE MC dial 0 marks directly below the index hairline. This operation places the marker pip at the electrical center of the display.

o. Rotate the CENTER FREQUENCY controls to position the marker pip at the physical center of the crt display.

p. Set the SYNC SELECTOR switch in the OFF position.

q. Set the SWEEP SPEED control to 8.

r. Rotate the MARKER AMPLITUDE control to set the height of the marker pip at approximately three inches.

s. Check that the proper tuning unit for the frequency range to be covered has been installed.

t. Rotate the TUNING control to position the index at the low end of the FREQUENCY IN MEGACYCLES dial.

u. Connect the output jack of a microwave signal generator, with appropriate range for the particular tuning head, to the DIRECT RF INPUT jack via RF Cable Assembly W72 for a CW output of less than -20 dbm. If the output is greater than -20 dbm, the signal source should be connected to the ATTENUATOR RF INPUT. When this is done while using Tuning Units STU-1WA and STU-3WA, it is necessary to connect the ATTENUATOR OUTPUT to the DIRECT RF INPUT by means of the patch cable supplied with the unit.

v. Rotate the TUNING control until a pip representing the incoming r-f signal appears on the crt screen. The signal will enter the display from the right. If the display is excessively large, vary the VERT GAIN control to set the height of the pip at a convenient level.

w. Continue rotating the TUNING control until the pip representing the incoming r-f signal coincides with the MARKER pip.

x. The frequency of the unknown signal is then read directly from the FREQUENCY IN MEGACYCLES dial. However, when Tuning Unit STU-1WA, STU-2WA or STU-3WA is being used, it is necessary to determine which of the two frequency bands marked on the dial is to be read. To determine which of the two frequency bands is to be read, proceed as follows:

(1) Align the true signal display with the marker pip.

(2) Set the FREQUENCY DIFFERENCE MC dial to read 40 mc. This will move the marker pip 40 mc away from the display signal.

(3) Note the readings of the bands marked on the FREQUENCY IN MEGACYCLES dial.

(4) Adjust the TUNING control until the signal display is aligned with the marker pip.

(5) Again note the readings of the bands marked on the FREQUENCY IN MEGACYCLES dial. The band on which the frequency reading has changed by 40 mc from the reading obtained in step (3) is the one that will be used to read the frequency of the unknown signal.

y. Set the FREQUENCY DIFFERENCE MC dial to zero and align the signal display with the marker pip. Read the frequency of the unknown signal from the FREQUENCY IN MEGACYCLES dial using the band noted in step x(5).

2-9. MEASUREMENT OF RELATIVE R-F POWER. The relative r-f power difference between two signal sources may be measured in the following manner: Assume that two signal pips appear on the crt display, separated by not more than 80 mc. In this example, the larger signal pip is termed "A" and the smaller "B".

a. Position the LOG-FILTER-LIN switch to LIN.

(1) Observe the position of the smaller signal, pip B. Mark its location on the crt graticule and note its height. For example, pip B reaches a height of 1 cm.

(2) Rotate the TUNING control to position the second signal, pip A, to the mark that located pip B. Note the height of pip A. For example, pip A reaches a height of 3.5 cm.

(3) Refer to the voltage ratio to decibels conversion table (table 2-2), which shows that, for a voltage ratio of 3.5 to 1, signal pip A is approximately 10.9 db greater than signal pip B. The relative difference, in db, of the two signals can also be found by use of the following formula:

Relative difference (in db)

$$= 20 \log_{10} \frac{\text{Height of signal pip A}}{\text{Height of signal pip B}}$$

$$= 20 \log_{10} \frac{3.5 \text{ cm}}{1 \text{ cm}} = 20 \log_{10} 3.5$$

$$= 20 \times 0.544 = 10.88$$

b. Position the LOG-FILTER-LIN switch to LOG.

(1) Observe the position of the smaller signal, pip B. Mark its location on the crt graticule and note its height.

(2) Rotate the TUNING control to position the second signal, pip A, to the mark that located pip B. Note the height of pip A.

(3) The difference in height between pips A and B, in graticule divisions, multiplied by 3, is the relative difference of signal amplitude, in db.

2-10. USING THE VOLTAGE RATIO TO DB CONVERSION TABLE. The relation of voltage ratio to db can be determined rapidly by referring to table 2-2 and using the following procedure:

a. Convert the ratio of signal heights to a number consisting of units, tenths, and hundredths.

b. Locate the number obtained in step a above, (or the number closest to it), in the body of table 2-2.

c. Read the db value of the signal height ratio in the following manner:

(1) Note the whole number appearing in the +DB (if the signal height ratio is greater than one) or -DB (if the signal height ratio is less than one) column found at the left or right, respectively, of table 2-2, corresponding to the row in which the ratio appears.

(2) Note the decimal portion appearing at the head of table 2-2 which corresponds to the column in which the voltage ratio appears.

(3) Add the two values obtained in steps 1 and 2, above. This is the db ratio of the signal amplitudes.

Example: If the signal height ratio is 3.5, locate the value 3.51 (the number closest to 3.5) in the main body of the table. The number in the +DB column corresponding to this is 10. Next, locate the decimal portion by locating the head of the column in which the ratio appears, or 0.9. Adding these two numbers, the db ratio of +10.9 is obtained.

2-11. MEASUREMENT OF ABSOLUTE POWER. To determine the absolute power level of a signal that is under observation, proceed as outlined in paragraph 2-9. Then proceed as directed in the following steps:

a. Rotate the FREQUENCY DIFFERENCE MCS control to position the marker pip beside the pip representing the incoming r-f signal.

b. If the pip representing the incoming signal fluctuates in amplitude, adjust the MARKER AMPLITUDE control so that the marker pip height corresponds to the maximum amplitude of the signal pip.

c. Remove the incoming r-f signal from the TSA-W input jack.

Note

Be careful to avoid disturbing the settings of all the controls on the front panel of the TSA-W.

d. Apply the same type of signal from a calibrated signal generator to the same input jack. Tune the generator to position the pip representing its output signal where the unknown signal was, (beside the marker pip).

e. Adjust the power level control of the signal generator to obtain a signal pip which has the same height as the marker pip appearing on the crt screen. The absolute power level of the signal being analyzed may now be determined by reading the power setting of the signal generator.

Note

If the original signal under observation was applied to the TSA-W through an attenuator (either internal or external), the amount of attenuation must be taken into account and added to the reading of the signal generator power setting.

2-12. DETERMINING THE WIDTH OF ANY LOBE OF A SIGNAL SPECTRUM. To determine the width of any lobe of a signal spectrum, proceed as outlined below:

a. Connect operating power to the TSA-W.

b. Connect I-F Cable Assembly W80 as a jumper between the PREAMP OUTPUT jack and the IF INPUT jack.

c. Adjust the HOR GAIN, HOR POS, FOCUS, and BRIGHTNESS controls to obtain a sharp base line on the crt screen.

d. Adjust the VERT POS control to locate the base line on the crt screen directly below the horizontal line etched with vertical marks on the crt graticule.

e. Set the DISPERSION switch to the HIGH position.

f. Rotate the DISPERSION control fully clockwise.

g. Rotate the VERT GAIN control to obtain approximately one-eighth inch of noise on the crt screen.

h. Rotate the MARKER AMPLITUDE control clockwise, beyond its OFF position.

i. Rotate the FREQUENCY DIFFERENCE MCS TUNING control to line up the 0 mark (inscribed on the DIFFERENCE FREQ-MCS dial) directly below the index hair-line.

j. Rotate the CENTER FREQUENCY control to position the marker pip at the physical center of the crt screen.

k. Set the SYNC SELECTOR switch to the OFF position.

l. Set the SWEEP SPEED control to 8.

TABLE 2-2. RELATION OF VOLTAGE RATIO TO DB*

+DB	0.0	0.0	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	-DB
0....	1.00 1.00	1.01 .989	1.02 .977	1.04 .966	1.05 .955	1.06 .944	1.07 .933	1.08 .923	1.10 .912	1.11 .902	 0
1....	1.12 .891	1.14 .881	1.15 .871	1.16 .861	1.18 .851	1.19 .841	1.20 .832	1.22 .822	1.23 .813	1.25 .804	 1
2....	1.26 .794	1.27 .785	1.29 .776	1.30 .767	1.32 .759	1.33 .750	1.35 .741	1.37 .733	1.38 .724	1.40 .716	 2
3....	1.41 .708	1.43 .700	1.45 .692	1.46 .684	1.48 .676	1.50 .668	1.51 .661	1.53 .653	1.55 .646	1.57 .638	 3
4....	1.58 .631	1.60 .624	1.62 .617	1.64 .610	1.66 .603	1.68 .596	1.70 .589	1.72 .582	1.74 .575	1.76 .569	 4
5....	1.78 .562	1.80 .556	1.82 .550	1.84 .543	1.86 .537	1.88 .531	1.91 .525	1.93 .519	1.95 .513	1.97 .507	 5
6....	2.00 .501	2.02 .495	2.04 .490	2.07 .484	2.09 .479	2.11 .473	2.14 .468	2.16 .462	2.19 .457	2.21 .452	 6
7....	2.24 .447	2.26 .442	2.29 .437	2.32 .432	2.34 .427	2.37 .422	2.40 .417	2.43 .412	2.46 .407	2.48 .403	 7
8....	2.51 .398	2.54 .394	2.57 .389	2.60 .385	2.63 .380	2.66 .376	2.69 .372	2.72 .367	2.75 .363	2.79 .359	 8
9....	2.82 .355	2.85 .351	2.88 .347	2.92 .343	2.95 .339	2.99 .335	3.02 .331	3.05 .327	3.09 .324	3.13 .320	 9
10....	3.16 .316	3.20 .313	3.24 .309	3.27 .305	3.31 .302	3.35 .298	3.39 .295	3.43 .292	3.47 .288	3.51 .285	10
11....	3.55 .282	3.59 .279	3.63 .275	3.67 .272	3.72 .269	3.76 .266	3.80 .263	3.85 .260	3.89 .257	3.94 .254	11
12....	3.98 .251	4.03 .248	4.07 .245	4.12 .243	4.17 .240	4.22 .237	4.27 .234	4.32 .232	4.37 .229	4.42 .226	12
13....	4.47 .224	4.52 .221	4.57 .219	4.62 .216	4.68 .214	4.73 .211	4.79 .209	4.84 .207	4.90 .204	4.95 .202	13
14....	5.01 .200	5.07 .197	5.13 .195	5.19 .193	5.25 .191	5.31 .188	5.37 .186	5.43 .184	5.50 .182	5.56 .180	14
15....	5.62 .178	5.69 .176	5.75 .174	5.82 .172	5.89 .170	5.96 .168	6.03 .166	6.10 .164	6.17 .162	6.24 .160	15
16....	6.31 .158	6.38 .157	6.46 .155	6.53 .153	6.61 .151	6.68 .150	6.76 .148	6.84 .146	6.92 .145	7.00 .143	16
17....	7.08 .141	7.16 .140	7.24 .138	7.33 .136	7.41 .135	7.50 .133	7.59 .132	7.67 .130	7.76 .129	7.85 .127	17
18....	7.94 .126	8.04 .124	8.13 .123	8.22 .122	8.32 .120	8.41 .119	8.51 .117	8.61 .116	8.71 .115	8.81 .114	18
19....	8.91 .112	9.02 .111	9.12 .110	9.23 .108	9.33 .107	9.44 .106	9.55 .105	9.66 .104	9.77 .102	9.89 .101	19
20....	10.0 .100										20

*Refer to Page 2-9 for an explanation on how to use the above table.

m. Rotate the MARKER AMPLITUDE control to set the height of the marker pip at approximately three inches.

n. Refer to paragraph 1-10 for applicable tuning heads to cover the various frequency ranges from 10 through 40,000 mc.

o. Utilize the Model STU-1WA, STU-2WA, STU-3WA, or STU-5WA Tuning Head to cover the range of the signal under observation.

p. Rotate the TUNING control to locate the marker pip at the center of the spectrum lobe under observation.

q. Rotate the FREQUENCY DIFFERENCE MCS TUNING control so that the marker pip coincides with one edge of the spectrum lobe under observation.

r. Note the reading on the DIFFERENCE FREQ-MCS dial.

s. Rotate the FREQUENCY DIFFERENCE MCS TUNING control so that the marker pip coincides with the other edge of the spectrum lobe.

t. Note the reading on the DIFFERENCE FREQ-MCS dial.

u. Calculate the difference, in megacycles, between the readings obtained in steps r and s above. This figure is the width, in megacycles, of the particular lobe appearing in the crt display.

2-13. FINE FREQUENCY MEASUREMENT. If more than one signal is to be examined on the crt screen, the internal marker circuit may be used to determine the frequency difference between the two signals. This marker circuit is independent of the TUNING control and may be used to "set" the position on the crt screen of one signal while tuning to the second. If the signals are close in frequency, and both are seen on the crt screen, the marker pip may be moved by means of the FREQUENCY DIFFERENCE MCS TUNING control. This control accurately determines small frequency differences where the TUNING control is too coarse an adjustment. If two frequencies are very close together, as in multi-frequency transmitters, the frequency relationship can be carefully checked. The DISPERSION control and DISPERSION switch vary the dispersion of the display so that, at maximum dispersion, 80 mc appears across the crt screen and, at minimum dispersion, 60 kc is displayed. The minimum setting of the BANDWIDTH control makes it possible to use the TSA-W to its minimum resolution of 1 kc. Two signals can be thus distinguished if their frequency difference is 1 kc or more.

2-14. MEASURING FREQUENCY DRIFT. The marker pip and the FREQUENCY DIFFERENCE MCS TUNING control provide a method to determine frequency drift of any piece of equipment operating within the tuning range of the TSA-W. Set the marker pip so that it coincides with the signal under observation at the beginning of the test. The position of the DIFFERENCE FREQ-MCS dial is noted. At the end of the test, if the drift of the signal has been small, the marker pip may be moved to the new position of the signal on the crt screen. The difference between the original and new readings of the DIFFERENCE FREQ-MCS dial equals the actual drift of the signal under test. Generally, the period drift is not of as much interest as "frequency pulling", due to tighter coupling or changing load conditions. Again, the same "before and after" procedure may be used with the FREQUENCY DIFFERENCE MCS TUNING control now serving to determine the exact degree of "frequency pulling".

2-15. CHECKING FOR CONTINUOUS TRANSMITTER OUTPUT. The visual display of the TSA-W makes it useful in checking for "holes" in transmitter or signal generator operation. Often, using conventional test methods, low output or discontinuous operation over a small frequency range is not noticed. However, by tuning the equipment under test through its range, and tracking with the TUNING control on the TSA-W, the wide dispersion is used to permit careful examination of the entire spectrum.

2-16. REPRESENTATIVE SPECTRA. Figure 2-6 illustrates various types of spectra that may be observed on the crt screen of the TSA-W. These types of "pictures" may be observed when checking the spectrum of pulsed magnetron oscillators. The display will indicate the pulse width, pulse shape, and the amount of amplitude or frequency modulation on the pulse. In this way, the TSA-W may be used to determine the extent and type of modulation present in what should be a cw signal or a pulsed signal. The data presented in figure 2-6 may be summarized as follows:

a. Amplitude modulation tends to change the position of the null points.

b. Frequency modulation tends to raise the null points.

c. A combination of amplitude and frequency modulation tends to distort the symmetry of the spectrum.

d. Having established the presence of distortion in the spectrum, measurements can be made to determine the nature of the modulating pulse. Side bands associated with amplitude and frequency modulated signals may be observed and measured. The relative power between side lobes and the main lobes may be determined with a calibrated r-f attenuator. Also, the half-power points of the main lobe can be determined with a calibrated r-f attenuator by noting the signal amplitude on the screen before and after 3-db of attenuation is inserted.

2-17. MEASURING INCIDENTAL FM OF AN APPLIED SIGNAL. To measure the incidental

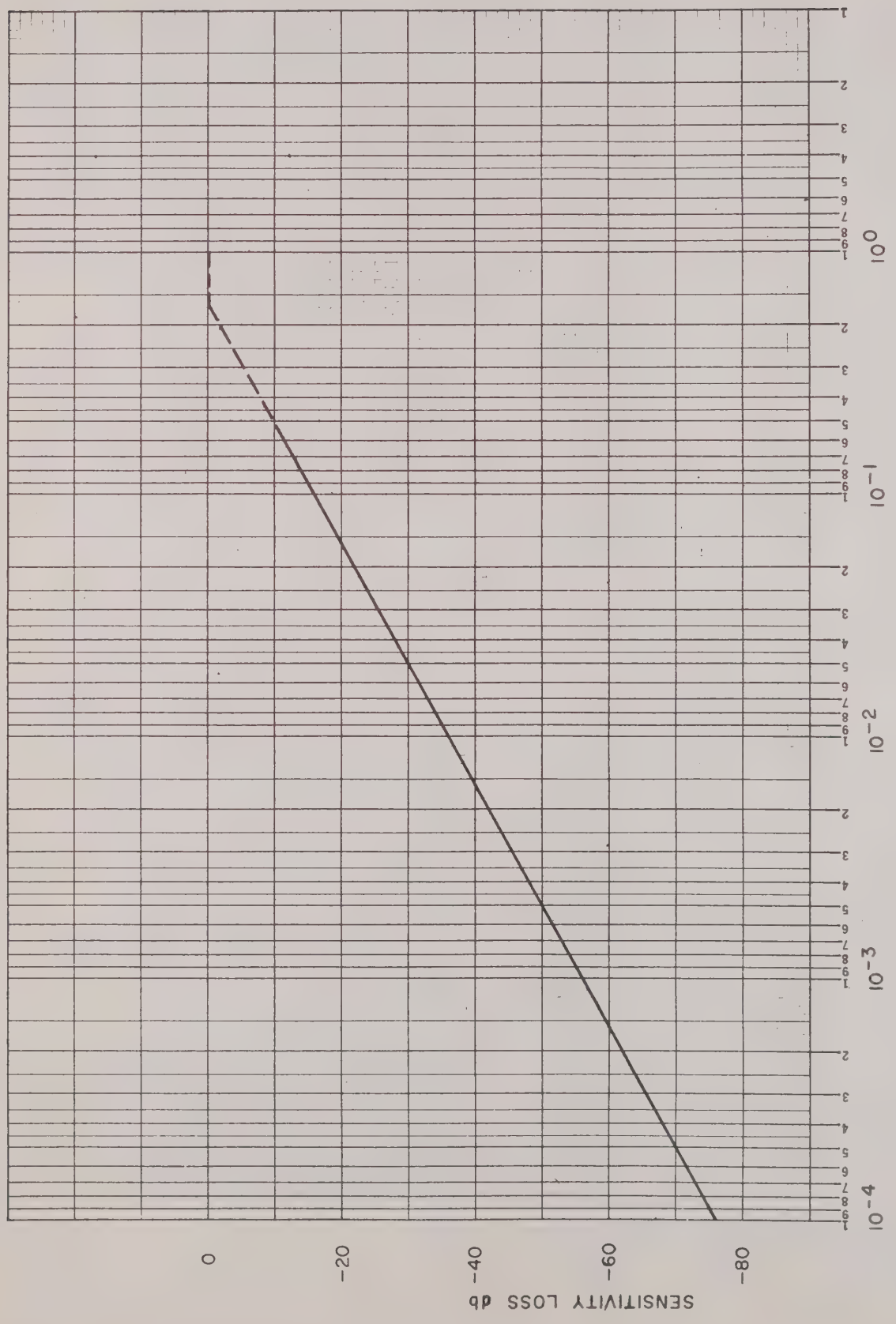


Figure 2-5. Sensitivity Loss as a Function of Signal Pulse Width and Bandwidth

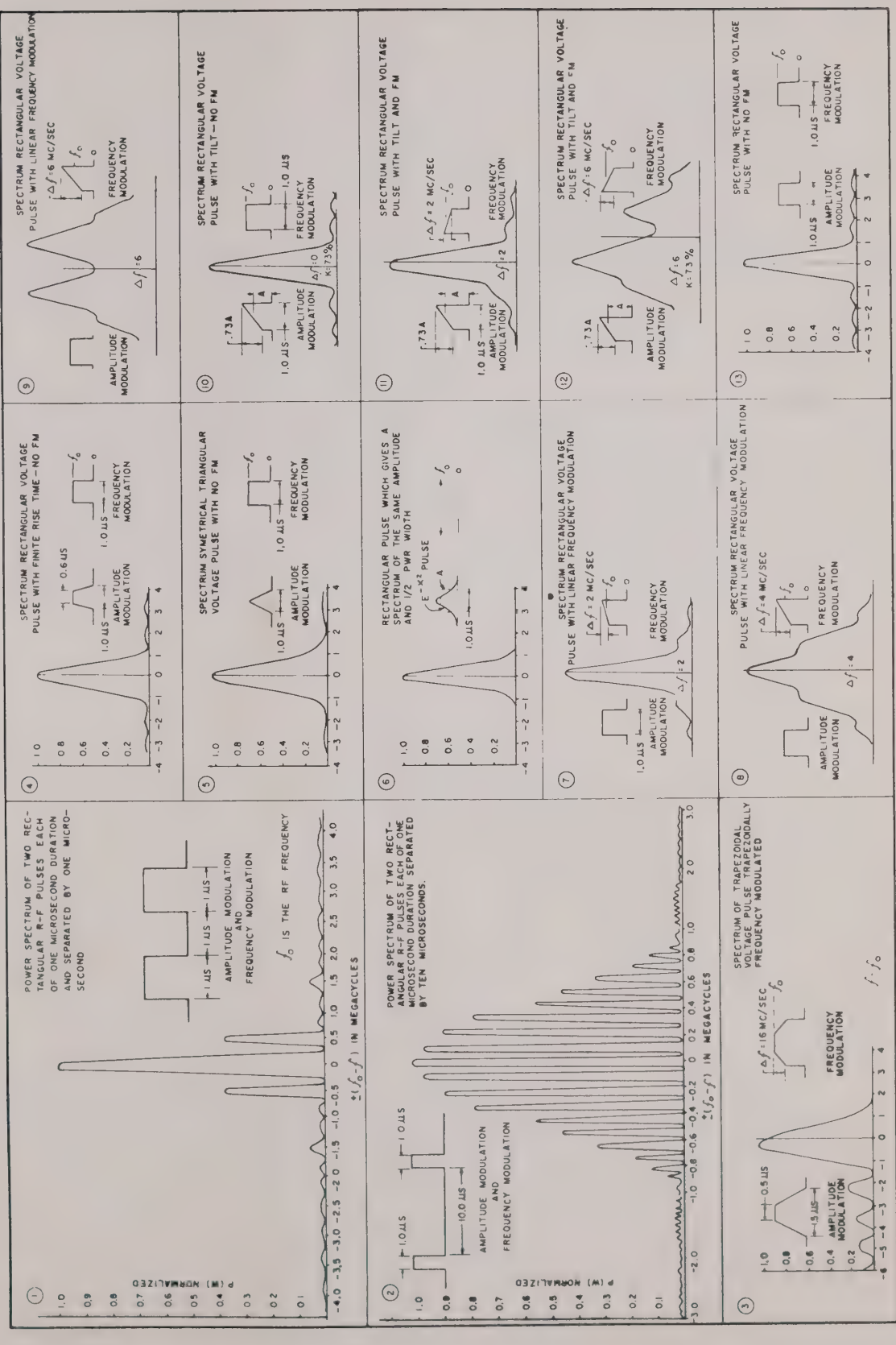

POWER SPECTRUM OF TWO RECTANGULAR R-F PULSES EACH OF ONE MICROSECOND DURATION AND SEPARATED BY ONE MICROSECOND
AMPLITUDE MODULATION AND FREQUENCY MODULATION
f_o IS THE RF FREQUENCY
P (W) NORMALIZED
$\pm(f_o-f)$ IN MEGACYCLES
POWER SPECTRUM OF TWO RECTANGULAR R-F PULSES EACH OF ONE MICROSECOND DURATION SEPARATED BY TEN MICROSECONDS.
SPECTRUM OF TRAPEZOIDAL VOLTAGE PULSE TRAPEZOIDALLY FREQUENCY MODULATED
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH FINITE RISE TIME - NO FM
SPECTRUM SYMETRICAL TRIANGULAR VOLTAGE PULSE WITH NO FM
RECTANGULAR PULSE WHICH GIVES A SPECTRUM OF THE SAME AMPLITUDE AND 1/2 PWR WIDTH
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH LINEAR FREQUENCY MODULATION
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH LINEAR FREQUENCY MODULATION
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH LINEAR FREQUENCY MODULATION
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH TILT - NO FM
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH TILT AND FM
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH TILT AND FM
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH NO FM
AMPLITUDE MODULATION
FREQUENCY MODULATION

Figure 2-6. Representative Spectra in Signal Analysis

fm of a signal, refer to figure 2-7 and proceed as follows:

a. Apply the signal to the appropriate input jack of the TSA-W and adjust the front panel controls so that the main lobe appears on the crt screen.

b. Adjust the VERT GAIN control so that the main lobe occupies three-quarters of the crt display.

c. Use the FREQUENCY DIFFERENCE MCS TUNING control to calibrate the bandwidth from one edge of the crt graticule to the other. Divide this bandwidth figure by 10 to find the frequency change by graticule division.

d. Rotate the SWEEP SPEED control fully counterclockwise.

e. Draw two lines to indicate the pulse envelope (see lines A and B of figure 2-7). Draw a horizontal line (C) from one side of the envelope to the other. Drop two vertical lines (D and E) to the base line from the points on the inner and outer edges of the envelope crossed by the horizontal line (C).

f. Count the number of divisions between lines D and E at the base. Use the frequency change per scale division, obtained in step c above, to calculate the frequency change. This frequency change represents the incidental fm of both the applied signal and that inherent within the TSA-W.

g. Measure the inherent incidental fm of the TSA-W by using a stable r-f signal at the same frequency as the applied signal. Subtract this from the total frequency change calculated in step f. The above procedure determines the incidental FM measurement of the applied signal.

2-18. PROPER USE OF BANDWIDTH CONTROL. Resolution, the ability to separate individual signals, is dependent upon both the rate of frequency sweep and the bandwidth of the i-f amplifier. When comparing two cw signals separated by a small frequency difference, rotate the BANDWIDTH control in a counterclockwise direction until the two signals are completely separated. If the two signals are so close that the BANDWIDTH control cannot separate them, a beat signal will be observed on the cathode-ray tube screen. This may be virtually eliminated by turning the LOG-FILTER-LIN switch to the applicable FILTER position. This introduces a video filter designed expressly for the removal of beat signals. For optimum resolution of a single or of widely separated cw signals, the BANDWIDTH control should be rotated counterclockwise until the amplitude of the signal starts to decrease. The sensitivity of the spectrum analyzer is dependent upon the

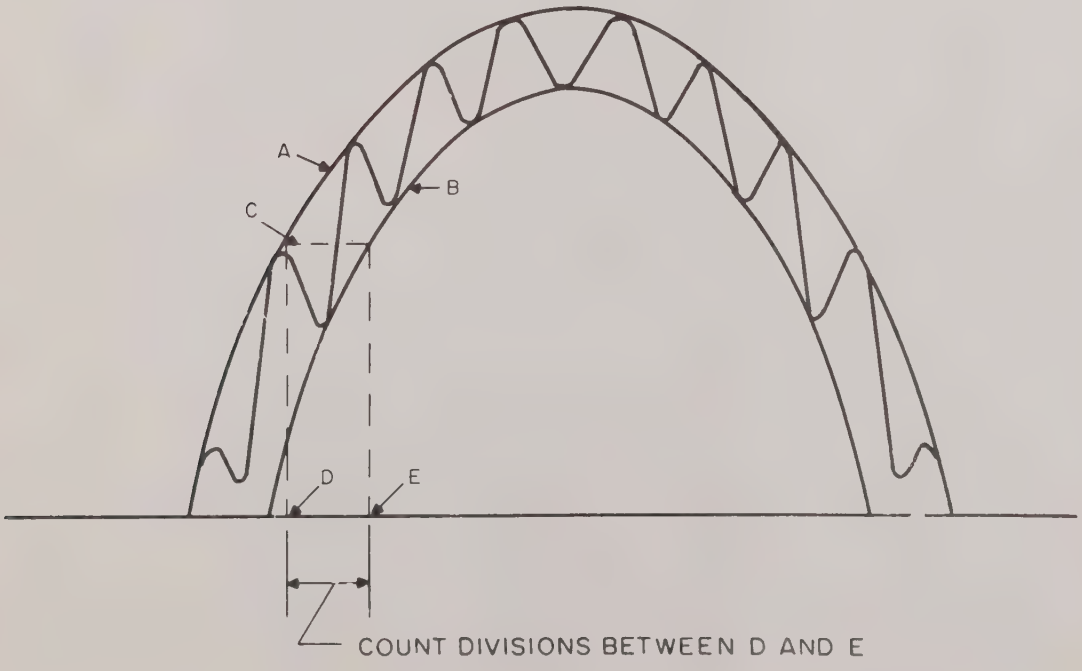


Figure 2-7. Technique for Measuring Incidental FM

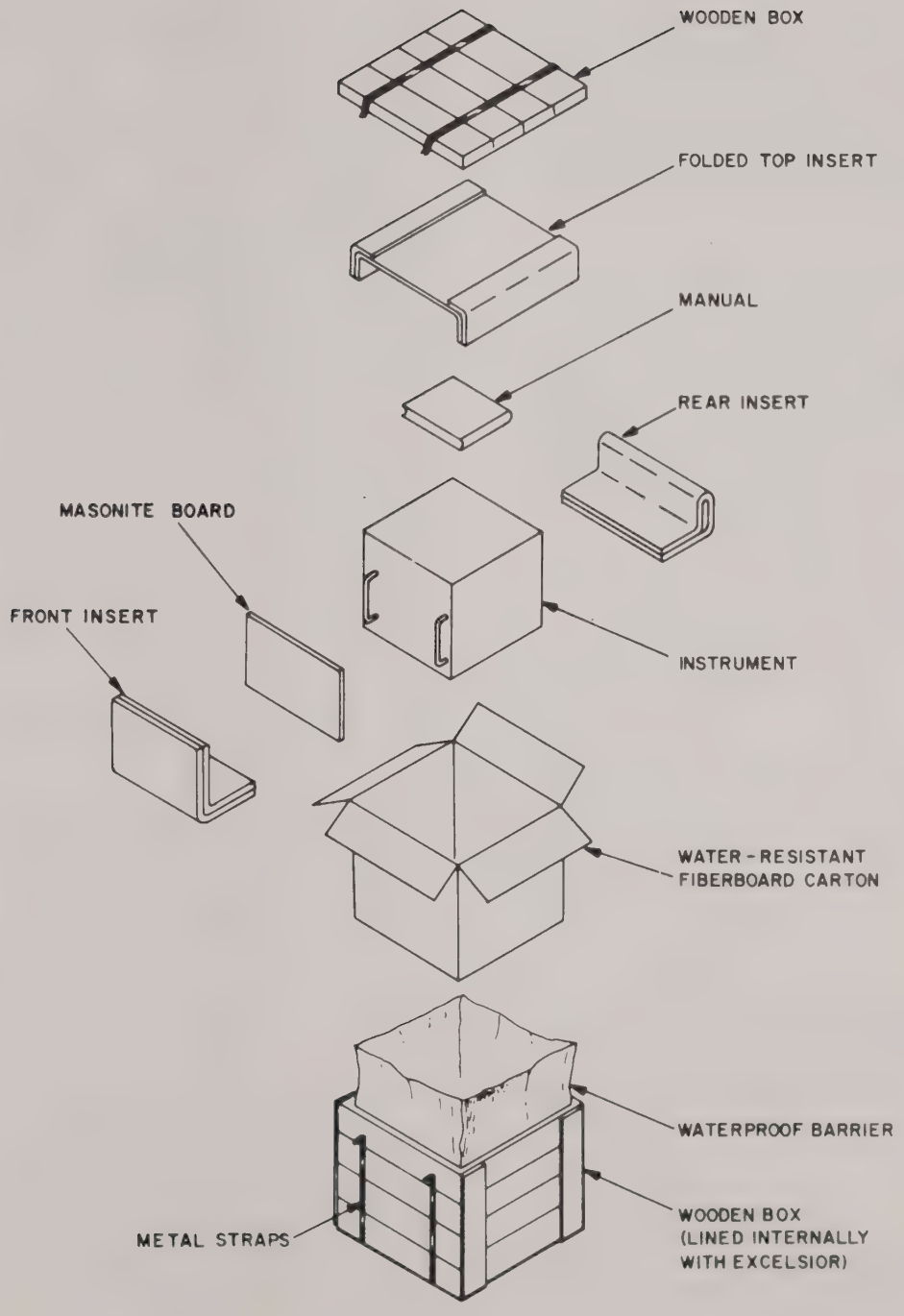


Figure 2-8. Packaging Diagram

dispersion, i-f bandwidth and sweep speed. When displaying a pulse spectrum, the sensitivity of the spectrum analyzer is dependent only upon the bandwidth. The sweep speed should be adjusted so that approximately 50 prf lines appear in the main lobe and the first side lobe on either side of the main lobe. For optimum resolution of the pulse spectrum, the product of i-f bandwidth and pulse width must be less than 0.1. If the bandwidth is greater than this value, the minima of the spectrum is no longer zero. This loss of sensitivity due to bandwidth and pulse width reduces the dynamic range of the spectrum analyzer for pulse-modulated signals. See figure 2-5.

2-19. PACKAGING INSTRUCTIONS.

2-20. PACKAGING FOR SHORT TERM STORAGE. If the Model TSA-W is to be stored for a relatively short period, cover it with a suitable protective covering such as a sheet of plastic or paper. Put the accessories and instruction manual in a carton or bag and fasten it to the unit to prevent loss. Store the Model TSA-W in a clean dry area where it will not be subject to extreme temperature.

2-21. PACKAGING FOR LONG TERM STORAGE OR SHIPMENT. If the Model TSA-W is to be stored for a long period of time, or shipped, proceed as follows:

a. If the original wrappings and carton have been saved, use them to package the equipment as shown in figure 2-8.

b. If new packing materials are to be used, assemble the necessary wrappings and carton.

c. Wrap the equipment in a moisture and vapor-proof barrier such as plastic or waterproof paper.

d. Wrap the accessories and instruction manual in a moisture and vapor-proof barrier.

e. Place the package in a suitable carton. Fill all empty spaces in the carton with suitable packing to prevent shifting of the packages within the carton.

f. Seal and mark the carton.

g. If the storage or shipping conditions make it necessary, enclose the carton within an outer carton or wooden box.

SECTION III

THEORY OF OPERATION

3-1. INTRODUCTION.

3-2. The Model TSA-W is basically a superheterodyne receiver using multi-conversion. It covers the frequency range between 10 and 44,000 mc. The Model TSA-W displays the frequency of the applied signal along its X axis while the amplitude of the frequency is displayed on the Y axis. This provides an accurate spectral display of the applied signal frequency. This section discusses the theory of operation for the Model TSA-W. It is divided into two sections, a simplified block diagram analysis and a detailed circuit analysis.

3-3. In order to simplify the discussion of the theory of operation the Model TSA-W may be divided into two major components: one of the five models of tuning units, STU-1WA, STU-2WA, STU-3WA, STU-4WA and STU-5WA, depending on the frequency range desired, and the model DU-2A basic unit.

3-4. SIMPLIFIED BLOCK DIAGRAM ANALYSIS. (See figure 3-1).

3-5. RF TUNING UNIT. The tuning unit consists of the 1st mixer and local oscillator. The mixer combines the incoming r-f signal with the local oscillator signal to produce the 160 mc i-f signal that is fed to the input of the wide band i-f amplifier. All tuning units except the Model STU-1WA use a klystron as the local oscillator. All tuning units use crystal mixers to combine the rf and local oscillator signals.

NOTE

Tuning Unit Model STU-1WA only uses a 6AF4 as the local oscillator. In addition it contains a wide band amplifier. After passing through the STU-1WA wide band amplifier the 160 mc i-f signal is fed to a wide band-pass filter and a narrow band-pass filter. These filters reduce spurious response in the 10 to 55 mc frequency range. The signal is then fed through a low-pass filter to the input of the wide band i-f amplifier.

3-6. WIDE-BAND I-F AMPLIFIER. The wide-band i-f amplifier, which has a center frequency of 160 mc, is a stagger-damped amplifier which offers 80-mc bandwidth to the first i-f signal output of the first crystal mixer. This amplifier also passes the marker signal with the first i-f, raising the level of both to a value suitable for further conversion.

3-7. SWEEP-FREQUENCY GENERATOR. The sweep-frequency generator is a local oscillator capable of producing a swept-frequency output centered at 224 mc. The frequency deviation from the center frequency is determined by the setting of the DISPERSION HIGH-LOW switch and the DISPERSION control. The sweep-frequency generator serves to heterodyne the first i-f signal (centered at 160 mc) with the output of the swept-frequency oscillators, producing the second intermediate frequency centered at 64 mc.

3-8. NARROW-BAND I-F AMPLIFIER. The narrow-band i-f amplifier serves to amplify the 64-mc second i-f output of the sweep-frequency generator, and then converts this signal to a 6-mc third i-f. The signal then undergoes a final conversion to a 500 kc fourth i-f and is amplified and detected for application to the video amplifier.

3-9. VARIABLE BANDWIDTH I-F CONTROL AMPLIFIER. The variable bandwidth i-f control amplifier, which is connected between the first and second converters of the narrow-band i-f amplifier, serves to adjust the resolution bandwidth of the fourth i-f signal between the limits of 1 and 80 kc, as determined by the BANDWIDTH control.

3-10. VIDEO CHASSIS. The video chassis contains the necessary circuits for amplifying the detected fourth i-f signal for application to the cathode-ray tube. The video chassis also contains the circuitry required for the generation of the required crt sweep voltages, for intensifying the video information presented on the cathode-ray tube display and for blanking out the cathode-ray tube sweep retrace.

3-11. MARKER OSCILLATOR. The marker oscillator produces a frequency that may be varied from 120 mc to 200 mc. This frequency is fed to the input of the wide band i-f amplifier. The COARSE control permits coarse adjustment of the marker oscillator frequency while the VERNIER control permits a vernier adjustment of the frequency. The MARKER AMPLITUDE control varies the amplitude of the marker output voltage, which in turn varies the size of the marker pip appearing on the signal display.

3-12. POWER SUPPLIES. Four electronically regulated power supplies are employed to obtain the dc voltages necessary for the operation of the Model TSA-W. The -1250 and -325 volt supply provides the operating voltages necessary for the operation of the klystron. The other three supplies, the -150, the +125, and the +300 volt supplies provide the necessary plate and biasing voltages for the operation of the rest of the TSA-W and tuning unit.

3-13. DETAILED CIRCUIT ANALYSIS.

3-14. The simplified and detailed block diagrams, figures 3-1 and 3-2 respectively, should be used in conjunction with the schematic diagrams, figures 5-1 through 5-10.

3-15. TUNING UNIT LOCAL OSCILLATOR. (See figures 5-6 thru 5-10.) All tuning units with the exception of the Model STU-1WA employ a klystron as the local oscillator. The STU-1WA employs a 6AF4 triode tube as a tuned transmission line oscillator. When a klystron is used as the local oscillator it is operated in a typical reflex klystron oscillator circuit. The frequency of the local oscillator is always 160 mc higher than the frequency of the incoming signal. In the higher band of operation, (tuning units STU-1WA through STU-3WA have two bands), the second harmonic of the local oscillator is used to beat with the incoming signal. The reflex klystron oscillator operates at a 3/4 wavelength cavity mode. It is tuned by changing the position of a non-contacting short-circuiting choke assembly within the oscillator cavity and by changing the reflector voltage. For example, the Model STU-2WA tuning unit employs a 1-3/4 mode over the frequency range from 910 mc to 1500 mc. In the vicinity of 1500 mc the reflector voltage becomes excessively high and mode switching is employed. At the mode switch point a microswitch is activated by a nylon cam on the tracking potentiometer shaft. Activating the microswitch reduces the reflector voltage to the proper value for the new mode of operation. The voltage applied to the reflector of the klystron is simultaneously tracked with tuning dial rotation by means of the tracking potentiometer. The 6X4 protects the klystron by preventing the reflector from going positive with respect to the cathode. The tuned transmission line oscillator used in tuning unit Model STU-1WA is also operated at a frequency 160 mc higher than the incoming signal. When the STU-1WA is being operated on its higher band, the second harmonic of the local oscillator is used to beat with the incoming signal. The parallel transmission line which tunes the oscillator is operated in a 1/4 wave mode. It is tuned by changing the position of a contacting short-circuit. The contacting short is tracked with the tuning dial by means of the tuning dial drive gears.

3-16. WIDE-BAND I-F AMPLIFIER, CIRCUIT DESCRIPTION. (See figures 3-2 and 5-2.) The 160-mc center frequency first i-f signal from the first crystal mixer is applied to input jack J701 of the wide-band i-f amplifier via coaxial cable assembly W90. The d-c crystal current is passed through the low-pass filter comprised of inductor L708, capacitors C701 through C704, resistors R701 through R704, and ferrite FE701, terminating at pin H of jack J704.

3-17. The i-f portion of the first crystal mixer output is coupled, through the 160-mc resonant circuit comprised of inductor L719 and capacitor C741, to the cathode of grounded-grid amplifier V701. This i-f stage serves as an impedance matching device, matching the 50-ohm cable impedance to the input impedance of the grounded-grid second stage V702. The output of this grounded-grid stage and the output of the marker oscillator (when the MARKER AMPLITUDE control is rotated clockwise from its OFF position) are then applied to the control grid (pin 7) of i-f amplifier V702. The stagger-damped cascode amplifier, V702, has a center frequency of 160 mc and a bandwidth of 80 mc. The amplified output of V702 is taken across variable inductor L704 and coupled to the grid of V703. Amplifiers V703 and V704 are similar to V702 in operation. They are both stagger-damped cascode amplifiers, providing adequate gain over the 80-mc bandwidth of the wide-band i-f amplifier.

3-18. SWEEP-FREQUENCY GENERATOR, CIRCUIT DESCRIPTION. (See figures 3-2 and 5-2.) The sweep-frequency generator serves the dual function of generating a swept frequency whose center frequency is 224 mc and heterodyning this swept signal with the 160-mc output of the wide-band i-f amplifier. The amount of sweep (or deviation) from the 224-mc center frequency is determined by the amplitude of the sawtooth voltage obtained from the video chassis. Coarse adjustment of this sawtooth voltage is accomplished by DISPERSION HIGH-LOW switch S502 and fine adjustment by the DISPERSION control R538.

3-19. The sweep-voltage output of the video amplifier is coupled, via jack J501, coaxial cable assembly W85, and jack J402, to the control grid of d-c amplifier V403. The center frequency of the oscillators is controlled by the CENTER FREQUENCY COARSE-FINE controls. These controls provide a DC voltage which is added to the sawtooth signal present at the grid of V403. The current sawtooth applied to reactor L402 causes a flux change in the gap of its laminations. In this gap ferrite cores are placed on which L405 and L407 are wound. The change in flux varies the permeability of the cores which causes the inductance of L405 and L407 to vary. This produces a frequency change in the oscillators. To compensate for the slight non-linearity of the circuit an additional DC bias current is applied to the reactor L402, controlled by R403.

3-20. When the DISPERSION HIGH-LOW switch is in the HIGH position, the high dispersion

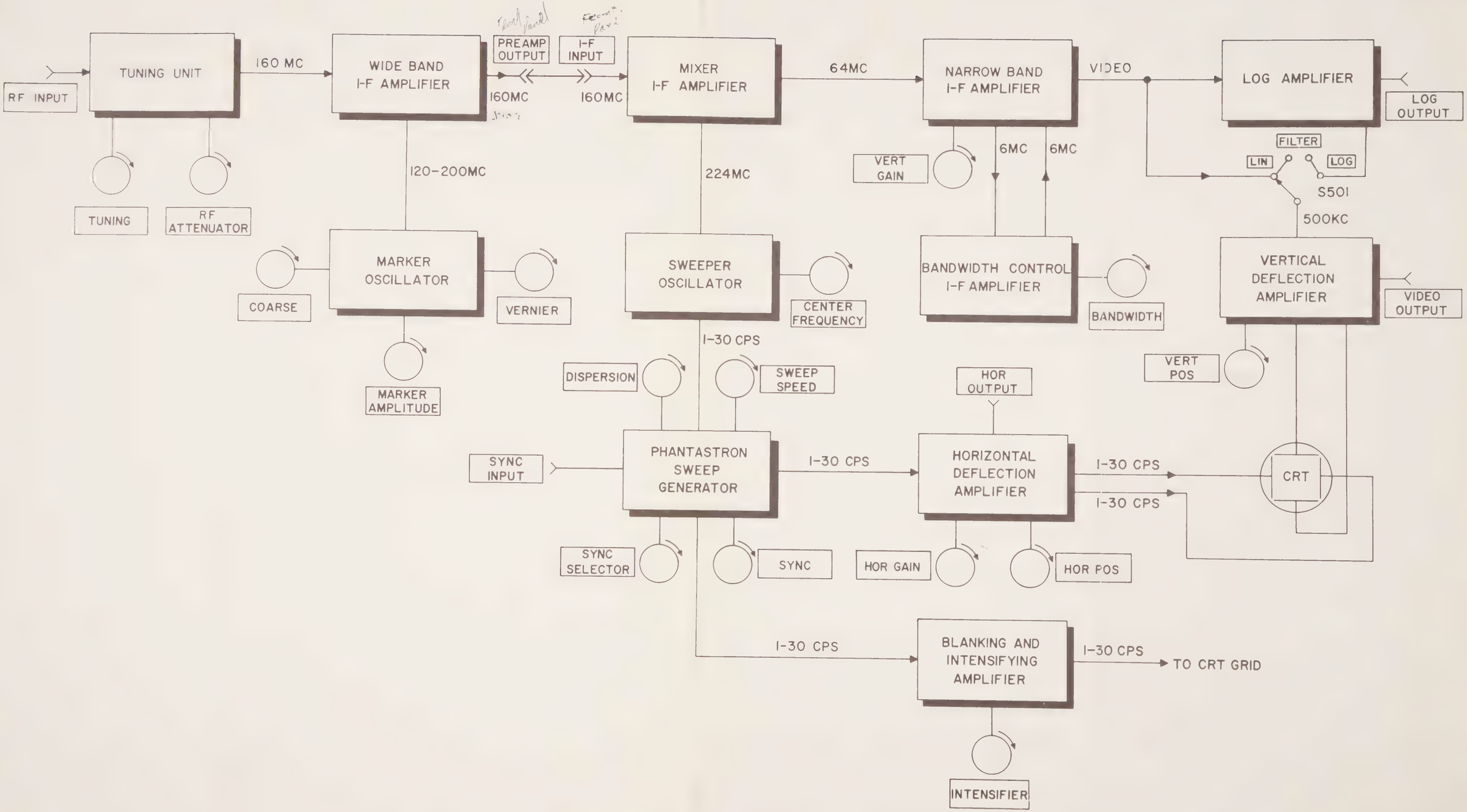
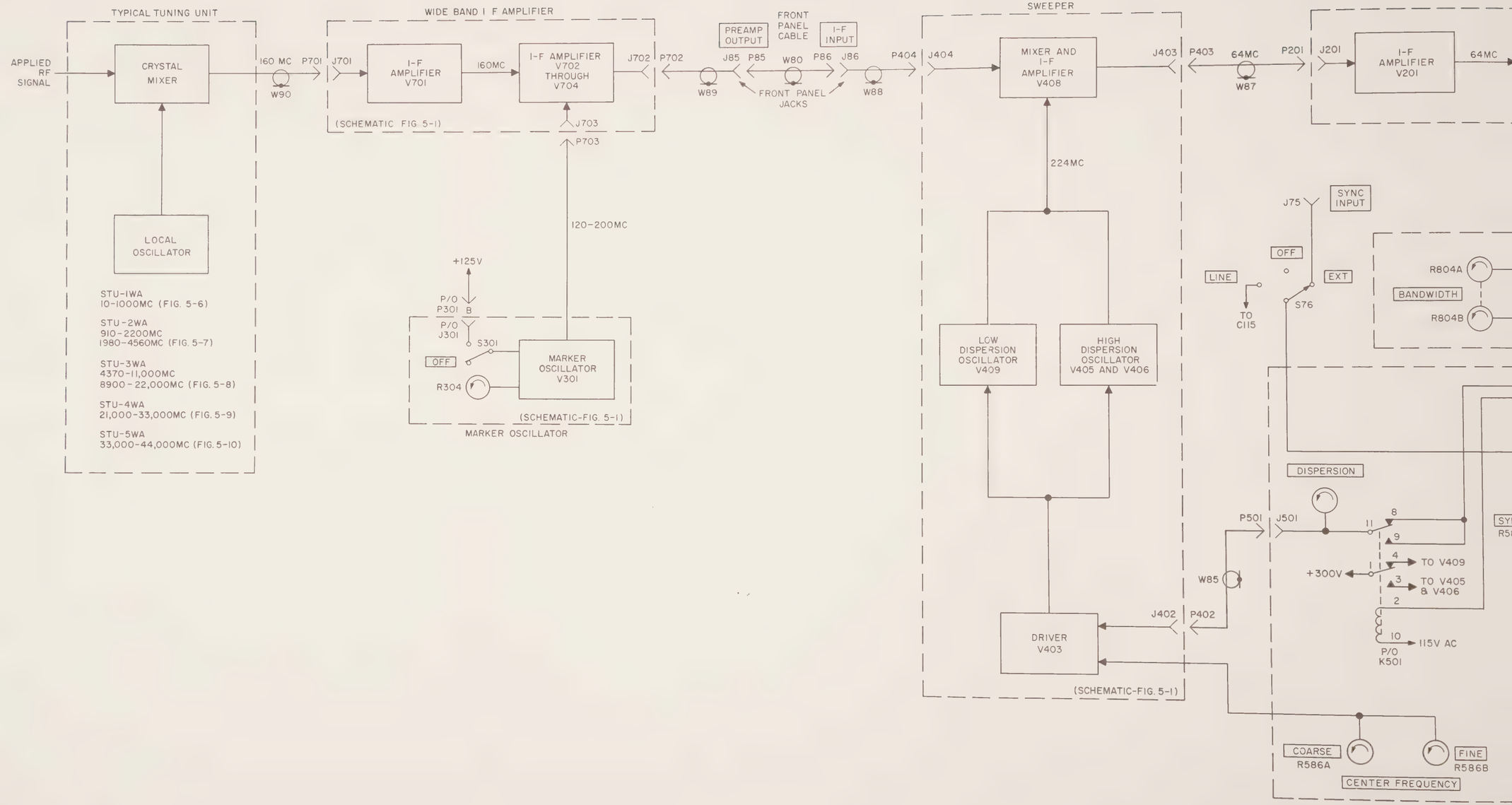


Figure 3-1. Simplified Block Diagram, Model TSA-W


TYPICAL TUNING UNIT
APPLIED RF SIGNAL
CRYSTAL MIXER
LOCAL OSCILLATOR
160 MC
P701
W90
STU-1WA
10-1000MC (FIG. 5-6)
STU-2WA
910-2200MC
1980-4560MC (FIG. 5-7)
STU-3WA
4370-11,000MC
8900-22,000MC (FIG. 5-8)
STU-4WA
21,000-33,000MC (FIG. 5-9)
STU-5WA
33,000-44,000MC (FIG. 5-10)
WIDE BAND I F AMPLIFIER
J701
I-F AMPLIFIER V701
160MC
I-F AMPLIFIER V702 THROUGH V704
J702
P702
(SCHEMATIC FIG. 5-1)
J703
P703
120-200MC
+125V
P/O P301 B
P/O J301
S301
OFF
R304
MARKER OSCILLATOR V301
(SCHEMATIC-FIG. 5-1)
MARKER OSCILLATOR
PREAMP OUTPUT
FRONT PANEL CABLE
I-F INPUT
J85
P85
W80
P86
J86
W89
W88
FRONT PANEL JACKS
P404
SWEEPER
J404
MIXER AND I-F AMPLIFIER V408
J403
224MC
LOW DISPERSION OSCILLATOR V409
HIGH DISPERSION OSCILLATOR V405 AND V406
DRIVER V403
J402
P402
P501
W85
(SCHEMATIC-FIG. 5-1)
P403
64MC
W87
P201
J201
I-F AMPLIFIER V201
64MC
J75
SYNC INPUT
OFF
LINE
EXT
TO C115
S76
R804A
BANDWIDTH
R804B
DISPERSION
J501
8
11
9
4
TO V409
+300V
1
3
TO V405 & V406
2
10
115V AC
P/O K501
COARSE
R586A
FINE
R586B
CENTER FREQUENCY

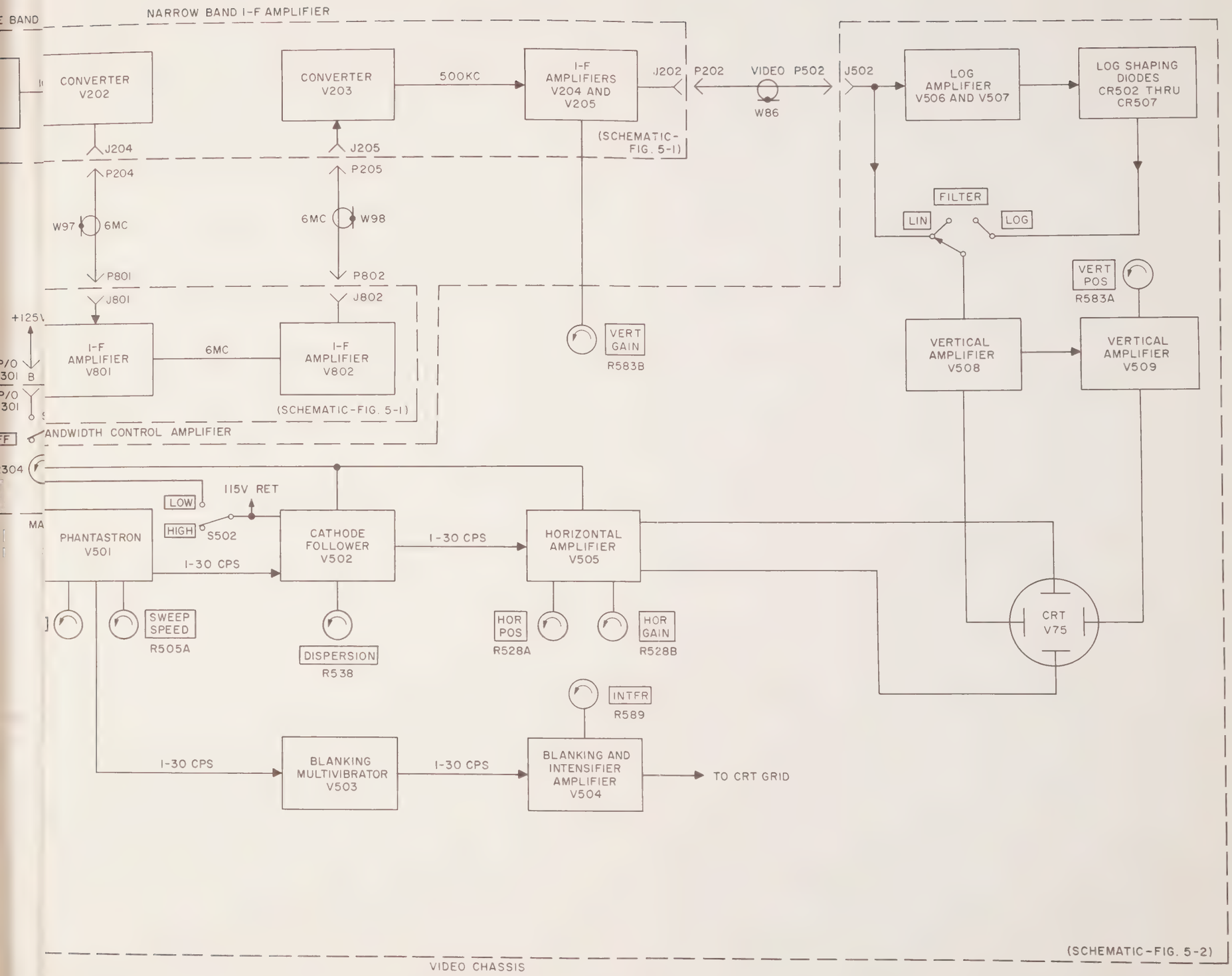


Figure 3-2. Detailed Block Diagram

swept-frequency local oscillator is energized, producing a signal whose frequency is swept between the limits of 184 mc and 264 mc (center frequency of 224 mc). This signal is coupled to second crystal mixer CR402, which heterodynes it with the 160-mc output of the wide-band i-f amplifier, producing the second i-f signal centered at 64 mc.

3-21. When the DISPERSION HIGH-LOW switch is in the LOW position, the low dispersion swept-frequency local oscillator is energized, producing a signal whose frequency is swept between the limits of 219 mc and 229 mc (the center frequency again being 224 mc). In both cases (HIGH or LOW position of the DISPERSION HIGH-LOW switch) the frequency excursion of the local oscillators specified is for full clockwise rotation of the DISPERSION control. The excursion is reduced when the control is adjusted to any other position other than fully clockwise.

3-22. The second intermediate frequency signal produced in second crystal mixer CR402 is transformer coupled (via L408, which is tuned to 64 mc) to the control grid of i-f amplifier V408. The output of this stage is transformer coupled (via L409, which is also tuned to 64 mc) to the input jack of the narrow band i-f amplifier (via J403 and coaxial cable assembly W87).

3-23. NARROW-BAND I-F AMPLIFIER, CIRCUIT DESCRIPTION. (See figures 3-2 and 5-2.) The narrow-band i-f amplifier serves the triple purpose of amplifying the second i-f signal, converting the second i-f signal first to 6 mc (third i-f) and then to the final i-f frequency of 500 kc, and detecting the fourth i-f signal. The video information is then applied to the video amplifier. The 64-mc output of the wide-band i-f amplifier is applied to the primary of transformer T201, which is tuned to 64 mc. The signal appearing at the secondary is coupled to the control grid of i-f amplifier V201. The output of this amplifier is taken across the parallel resonant tank circuit comprised of variable inductor L202 (which is tuned to 64 mc) and capacitor C205, and is coupled to the third grid (pin 7) of converter V202.

3-24. The local oscillator section of the pentagrid converter, V202, is controlled by crystal Y201. This crystal is connected between the control grid (pin 1) and the second and fourth grids (pin 6). The second and fourth grids act as the tuned plate and the control grid as the grid of a 58-mc triode oscillator. The oscillator output is coupled through the electron stream to modulate the incoming 64-mc signal. The plate load, consisting of variable inductor L223 (and the associated stray capacitance) is tuned to 6 mc, passing the 6-mc signal resulting from the second harmonic of crystal Y201 and the 64-mc second i-f. This third i-f signal of 6 mc is coupled, via J204 to the variable bandwidth i-f control amplifier, which provides a means of adjusting the bandwidth of the third i-f signal.

3-25. The output of the variable bandwidth i-f control amplifier is returned to the narrow-band i-f amplifier, via J205, and is coupled to the third grid (pin 7) of V203, a pentagrid converter. The second and fourth grids act as the plate and the control grid is the grid of 6.5-mc triode oscillator. The oscillator output is coupled through the electron stream to modulate the incoming 6-mc signal. The plate load, consisting of variable inductor L209 (which is tuned to 500 Kc) and capacitor C221, passes the 500 kc fourth i-f signal to the control grid of i-f amplifier V204.

3-26. I-f amplifiers V204 and V205, in cascade, amplify the 500-kc signal to a level sufficient to provide a demodulated signal capable of fully driving the vertical amplifiers. The output of V205 is coupled to detector CR201, which rectifies the fourth i-f signal. The detected signal is then coupled to the video amplifier via J202 and coaxial cable assembly W86.

3-27. The over-all gain of the narrow-band i-f amplifier is controlled by VERT GAIN control R583B (located in the video chassis). Rotation of this control adjusts the d-c potential applied to the cathodes of i-f amplifiers V201 and V204, thus determining the gain of these stages.

3-28. VARIABLE BANDWIDTH I-F CONTROL AMPLIFIER, CIRCUIT DESCRIPTION. (See figures 3-2 and 5-2.) The variable bandwidth i-f control amplifier serves to adjust the final resolution bandwidth of the i-f signal within the range from 1 to 80 kc. The control amplifier is basically two crystal filter stages (V801A and V801B) and an amplifier stage (V802).

3-29. The first crystal filter stage is basically a bridge configuration with the arms being R802, R803, C802, and Y801. The output is developed across T801. The bandwidth, when coupled through Y801, is very narrow because the crystal is effectively an extremely high Q resonant circuit. The bandwidth, when coupled through C802, results in the response of the normal LC resonant circuit. When the BANDWIDTH control R804B is at its extreme counterclockwise (shorted) position, the output signal across T801 is produced only by the coupling through Y801 which results in an extremely narrow-band signal. Conversely, when R804B is at its extreme clockwise position (effectively open) the output signal is produced by the broadband coupling through C802. The second stage operates in the same manner. Combined, they control the i-f bandwidth over an extremely large range.

3-30. The output of V801B is the amplified V802. The output of this stage is coupled (via J802) back to the narrow-band i-f amplifier.

3-31. VIDEO CHASSIS, CIRCUIT DESCRIPTION. (See figures 3-2 and 5-2.) The video chassis serves to generate the necessary sweep voltages required for the presentation of the video information on the screen of the cathode-ray display tube. It also amplifies the information to be displayed, and generates an intensifying and blanking potential which is applied to the control grid of the crt.

3-32. Log Shaping Circuit. A logarithmic display of the applied signal amplitude is presented on the CRT screen after flowing through a diode segmentation circuit which operates as follows:

a. The output of the narrow-band i-f amplifier is applied to the video amplifier via coaxial cable assembly W86 and jack J502. The detected 500-kc video signal appears at both the control grid of log amplifier V506 and the LIN contact of LOG-FILTER-LIN switch S501A.

b. When the LOG-FILTER-LIN switch is in the LOG position, the incoming video signal is amplified by log amplifier V506. The output of this stage is coupled to the pentagrid control grid pin 8, of log amplifier V507 for further amplification. The output of V507 is then applied to the triode control grid pin 2, of V507, which is a cathode follower. The signal is then applied to the diode segmentation circuit comprised of crystal diodes CR502 through CR507 and their associated resistors. Due to the biasing resistors connected to the diodes, each diode conducts at a signal voltage greater than the previous one. In this manner, the voltage drop across resistor R559 causes the output (which appears at S501A) to approach the log of the applied signal voltage.

3-33. The output of the log-circuit (when the LOG-FILTER-LIN switch is in the LOG position) or the output of the narrow-band i-f amplifier (when the LOG-FILTER-LIN switch is in the LIN position) is coupled to the control grid of vertical amplifier V508. When the LOG-FILTER-LIN switch is in one of the FILTER positions the video frequency response is reduced by the addition of C516. This suppresses the unwanted beat frequencies that are normally produced when comparing two signals separated by a very small frequency difference. V508 and V509 operate as cathode-coupled push-pull balanced deflection amplifiers. The use of balanced amplifiers insures proper linearity and minimum distortion of the displayed video information. The vertical positioning of the display is adjusted by VERT POS control R583A. The video output of the vertical amplifiers is directly coupled to the vertical deflection plates of the cathode-ray tube through pins A and B of mating connectors J504 and P504. Direct coupling provides a two-fold advantage; it permits broadband frequency response down to d-c; at the same time, it permits instantaneous trace positioning.

3-34. Sawtooth Generator. The function of the sawtooth generator is to provide the timing reference voltage for the horizontal amplifier V505, blanking multivibrator V503, and the sweep-frequency generator. This sawtooth voltage repetition rate is adjustable over the range from 1 to 30 cps by means of SWEEP SPEED control R505. Synchronization with the internal power line frequency may be set with SYNC control R76.

3-35. The sawtooth generator is comprised of phantastron V501 and cathode follower V502, which combine to form a free-running screen coupled phantastron sawtooth voltage generator. Phantastron V501 employs a pentode with two control grids. The suppressor grid has a sharp cutoff characteristic, and is used as an independent control element. Initially, the screen grid (pin 6) is conducting heavily, while the suppressor grid (pin 7) is effectively cutting off the plate (pin 5) current. (See A, B, and C of figure 3-3.) The instantaneous plate voltage (figure 3-3B) is at its maximum value. At the same time, the control grid (figure 3-3D) is at zero bias due to the positive voltage return of grid resistors R504 and R505A in series. The presence of any transient negative pulse at the plate of V501 is fed back to the control grid of V501 via cathode follower V502. This action causes the screen current to fall, resulting in a simultaneous rise in screen voltage (figure 3-3C). This voltage change is coupled to the suppressor grid (pin 7) through C504, causing the suppressor grid to initiate and maintain the plate current. The plate current now rises (with the plate voltage dropping) at a rate determined by the RC time constant of the grid circuit (C503, R504, and R505A). Waveform linearity is obtained by feedback between the plate and grid (pin 1). This feedback tends to maintain a constant current through the grid capacitor. The rise in plate current (and fall in plate voltage) continues until the plate bottoms and the tube saturates. At this point (figure 3-3A) the control grid voltage reverts to its normal zero bias condition, causing the screen and suppressor potentials to be restored to their original values. The plate current now starts to fall (plate voltage rises) until the plate voltage reaches +125 volts. The presence of a synchronizing voltage at the suppressor grid insures a constant sawtooth rate, determined by the setting of SWEEP SPEED control R505A.

3-36. Horizontal Amplifier. The sawtooth voltage output of cathode follower V502 pin 3 is applied to the control grid (pin 2) of horizontal amplifier V505 (through HOR GAIN control R528B). V505 is a twin-triode amplifier functioning as a cathode-coupled push-pull balanced amplifier. The sawtooth voltage is applied to the horizontal deflection plates of cathode-ray tube V75. The use of balanced amplifiers insures proper linearity and minimum distortion of the horizontal sweep voltage. Horizontal positioning of the trace is effected by means of HOR POS control R528A. The horizontal output of V505 is directly coupled, via pins C and D of connectors J504 and P504, to the cathode-ray tube, thus assuring linear operation at low sweep speeds.

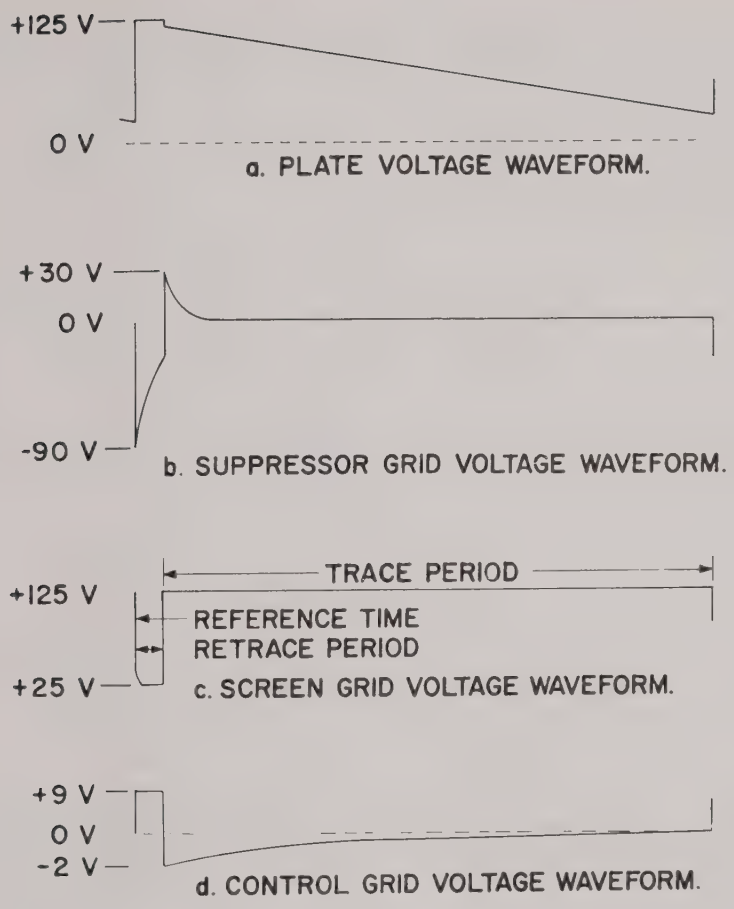


Figure 3-3. Sawtooth Generator Voltage Waveforms

3-37. Blanking Multivibrator. A portion of the output of the sawtooth generator, which consists of a pulse developed at the screen grid of phantastron V501, is coupled to the control grid (pin 7) of blanking multivibrator V503 through crystal CR501. The polarity of CR501 is such that only negative going pulses are passed to the grid. This negative-going pulse triggers V503, which functions as a one-shot cathode-coupled multivibrator. The negative going pulse corresponds to the start of the retrace period. For proper blanking, the width of this pulse must be adjusted to correspond to the retrace period. This is automatically accomplished by the ganged connection of R505B to the SWEEP SPEED control R505A. R515 is factory pre-set to adjust the tracking of R505B with R505A. The amplified output of the blanking multivibrator is coupled to the control grid, pin 2, V504.

3-38. Blanking And Intensifier Amplifier. The output of V503 is applied to the control grid (pin 2) of V504, where the signal is amplified and inverted. The inverted signal, which is of negative polarity, is applied to the control grid of the cathode-ray tube, blanking the display on the retrace portion of the display.

3-39. The output of vertical amplifier V508 is also coupled to the control grid pin 7 of V504. During those portions of the trace period when video information is being amplified by the vertical amplifier, the negative signal appearing at the plate of V508 is coupled to the control grid pin 7, of V504. This signal is amplified and inverted, and then applied to the control grid of the cathode-ray tube. In this manner, the displayed video information is amplified while

the base line intensity remains unchanged. Both the blanking and intensifier signals are available at the plate (pin 6) of V504.

3-40. TUNING UNIT CRYSTAL MIXER. (See figure 5-6 through 5-10.) The tuning unit crystal mixer consists of a silicon diode which mixes the incoming signal with the local oscillator signal to produce the 160 mc first i-f frequency. The crystal has non-linear characteristics, and as a result when the tuning units are being operated on their high frequency bands, the second harmonic of the local oscillator is mixed with the incoming signal to produce the 160 mc i-f frequency.

3-41. MARKER OSCILLATOR. (See figure 5-1.) The marker oscillator V301 is connected as a high frequency Colpitts oscillator tuned to a frequency of 160 mc. Two controls determine the operating frequency of the marker oscillator. The VERNIER control, variable capacitor C312, allows a fine adjustment of the marker oscillator frequency. The COARSE control, variable capacitor C302, allows a coarse adjustment of the marker oscillator frequency. When the FREQUENCY DIFFERENCE MC dial is set at zero by adjusting the VERNIER and COARSE controls, the marker oscillator operates at a frequency of 160 mc. This 160 mc output is fed to the wide band i-f. However, if the FREQUENCY DIFFERENCE MC dial is set to a reading other than zero the marker oscillator is tuned that much away from 160 mc. For example, if the FREQUENCY DIFFERENCE MC dial is set to -10 mc the marker oscillator will be tuned to 170 mc. In this case the marker pip will not appear in the center of the display, it will be displaced by 10 mc from the center. Thus, by varying the VERNIER and COARSE controls, the frequency at any point on the display is separated from the 160 mc first i-f frequency. It may then be measured and the frequency difference in megacycles read directly from the FREQUENCY DIFFERENCE MC dial. In addition to the frequency difference scale there is also pulse width calibration. The calibration is in terms of pulse-width of rectangular pulses. To use it, both COARSE and VERNIER dials are set to zero and the signal is tuned in using the main tuning dial to line up the first significant point of the spectrum (usually a zero or the peak of the main lobe). The marker is then tuned to the next significant point and the pulse width is read directly off the dial. The MARKER AMPLITUDE control potentiometer R304 varies the amplitude of the marker signal fed to the wide band i-f amplifier. This varies the size of the pip produced on the display and allows for setting the pip to a convenient height.

3-42. POWER DISTRIBUTTION.

3-43. Power for the Model TSA-W Spectrum Analyzer is obtained from one unregulated and four regulated supplies. The unregulated supply furnishes the filament voltages, both AC and DC, while the regulated supplies produce the necessary DC voltages that are applied to the TSA-W.

3-44. To facilitate an understanding of power distribution in the TSA-W, reference should be made to figure 3-4. When power is initially applied to the unit, the tube filaments are energized. After a sixty-second warmup period, time-delay relay, K101, operates and the regulated DC voltages are applied to all the sub-chassis in the display unit, in the following sequence:

a. The klystron power supply provides power for the tuning units.

b. The +300 volt supply furnishes power for the Sweep Frequency Generator, the Video Amplifier and the CRT Power Supply.

c. The +125 volt supply furnishes power for the Wide-Band & Narrow-Band I-F Amplifiers, the Variable Bandwidth I-F Control Amplifier and the Marker Oscillator.

d. The -150 volt supply furnishes the bias voltages for the Video Amplifier.

3-45. Paragraphs 3-46 through 3-49 describe the circuitry of each regulated power supply. They should be used in conjunction with the Power Distribution Diagram, Figure 3-4.

3-46. KLYSTRON POWER SUPPLY. (See figure 5-3.) The klystron power supply is a conventional series regulated supply consisting of full wave rectifiers V101 and V102, series regulators V103 and V104, dc amplifier V105, and voltage regulators V106 through V110. The anode volts adjustment (R123) is set to produce a voltage of minus 1,250 volts when using the STU-3WA, STU-4WA or STU-5WA. The setting of the anode volts control determines the value of the bias applied to the control grid of dc amplifier V105. Any change in the minus 1,250 volts supplied to the klystron anode because of changes in loading causes a like change in the bias applied to the control grid of V105. Changing the bias of V105 changes the current flowing in the plate circuit which in turn changes the bias applied to the grids of series regulators V104 and V103. Changing the bias on V103 and V104 changes their plate resistance. Since this plate resistance is in series with the voltage divider the voltage applied to the klystron anode will change. The polarity of the voltage is such that a decrease in klystron anode voltage causes a decrease in plate resistance of the series regulators which causes the klystron voltage to return to normal. Voltage regulator V106 provides the necessary reference voltages for the operation of the regulator circuit. The reflector voltage is developed across V107 through V110. The -325 volt adjustment is made when using the STU-2WA after the anode voltage adjustment has been set and it is kept constant by the same method as described for the

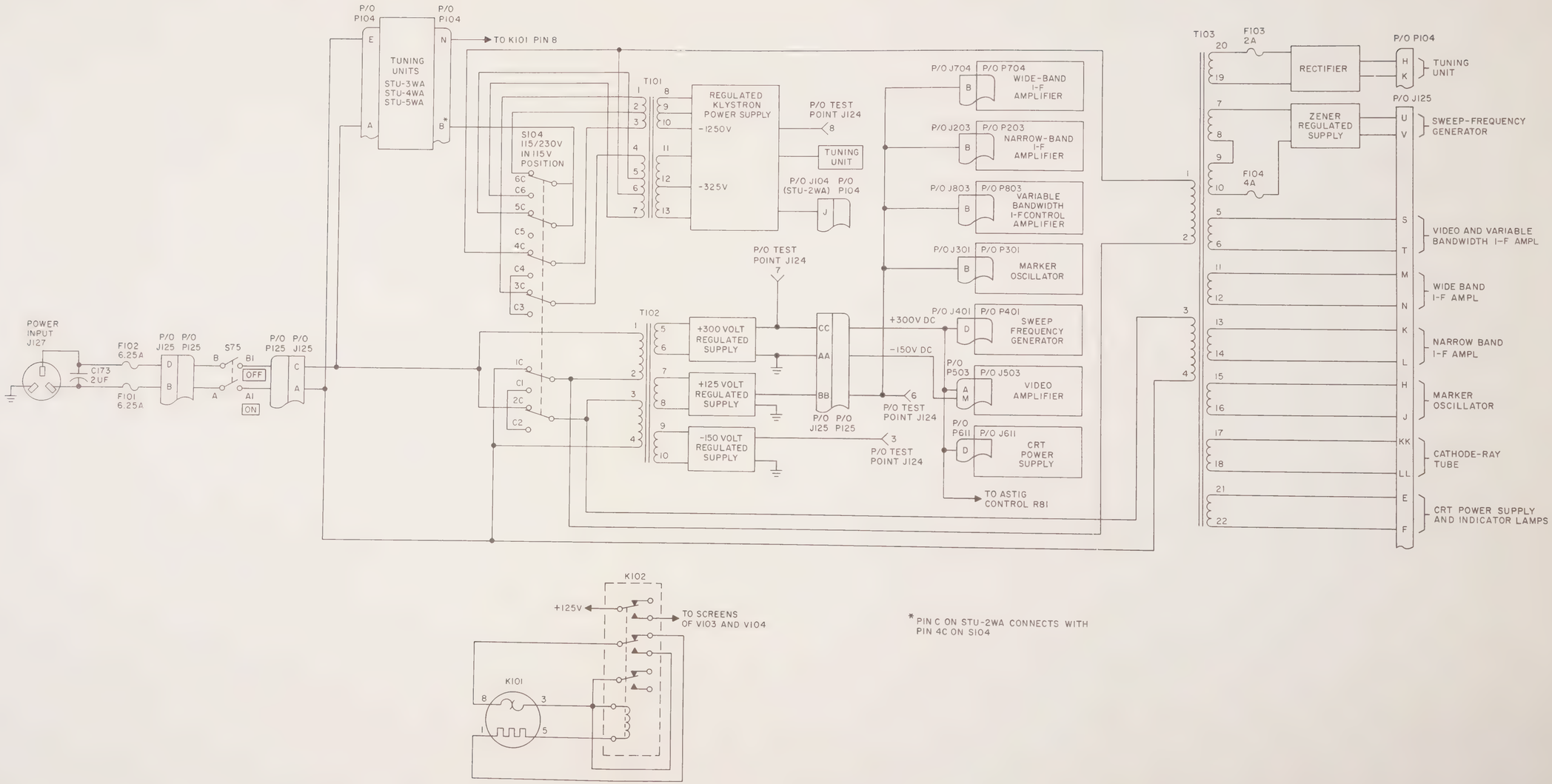


Figure 3-4. Power Distribution Diagram

anode voltage. When tuning units STU-3WA, STU-4WA, or STU-5WA are utilized, an internal jumper in the tuning unit automatically applies a-c power to the proper winding of T101 so that -1,250 volts is supplied to the klystron. However, when tuning unit STU-2WA is used, jumpers and resistors automatically convert the power supply for -325 volts operation.

3-47. +300 VOLT SUPPLY. (See figure 5-3.) The +300 volt supply is a conventional series-type degenerative voltage regulator consisting of series regulators V113 and 1/2 of V111 and DC amplifier V116. The bias on the grid of DC amplifier V116 is adjusted by the +300 V Adjust control R143 to such a value that the voltage appearing at the plate (pin 1) of that tube is the bias voltage for the control grids of series regulators V113 and V111 (pin 1) necessary to obtain the desired +300 volt output of the supply. Variations in the +300 volt supply output voltage due to fluctuations in the load current or power line voltage are amplified by DC amplifier V116. The voltage change at the plate (pin 1) adjusts the bias voltage applied to the grids of series regulators V113 and V111 (pin 1), which returns the output level of the supply to the required +300 volts.

3-48. +125 VOLT SUPPLY. (See figure 5-3.) The +125 volt supply is a conventional series-type degenerative voltage regulator consisting of series regulators V114 and 1/2 V111 and DC amplifier V117. The bias on the grid of DC amplifier V117 is adjusted by the +125 V Adjust control R147 to such a value that the voltage appearing at the plate (pin 1) of that tube is the bias voltage for the control grids of series regulators V114 and V111 (pin 4) necessary to obtain the desired +125 volt output of the supply. Variations in the +125 volt supply output voltage due to fluctuations in the load current or power line voltage are amplified by DC amplifier V117. The voltage change at the plate (pin 1) adjusts the bias voltage applied to the grids of series regulators V114 and V111 (pin 4), which returns the output level of the supply to the desired +125 volts.

3-49. -150 VOLT SUPPLY. (See figure 5-3.) The -150 volt supply is a conventional series-type degenerative voltage regulator consisting of series regulator V112, voltage regulator V118, and DC amplifier V115. The bias on the grid of DC amplifier V115 is adjusted by the -150 V Adjust control R154 to such a value that the voltage appearing at the plate (pin 1) of that tube is the bias voltage for the control grid of series regulator V112 necessary to obtain the desired -150 volt output of the supply. Variations in the -150 volt supply output voltage due to fluctuations in the load current or power line voltage are amplified by DC amplifier V115. The voltage change appearing at the plate (pin 1) adjusts the bias voltage applied to the grid of series regulator V112, which returns the output level of the supply to the desired -150 volts.

3-50. CRT SUPPLY. (See figure 5-4.) For the high-voltage low-current requirements of the cathode-ray tube, an r-f oscillator high-voltage supply is employed. High-frequency oscillations are developed in the Hartley-type circuit, the frequency of this oscillation being determined by the inductance of the entire primary winding of T603 and the capacitor C621. The output voltage appearing across the secondary of T603 (which is a step-up transformer) is applied to the high-voltage rectifiers V617 and V618, which are connected as a voltage doubler. The output of this network, which produces the +2,400 and -2,400 volts required, is applied to the various accelerating and control grids of cathode-ray tube V75. A discharge resistor is provided across the positive 2,400 volt supply as a means of quickly discharging the high-voltage when power is disconnected. The bleeder network in the negative 2,400 volt supply permits adjustment of the various accelerating and control voltages applied to V75. This circuit arrangement also assures discharge of the high-negative voltage when the power is disconnected.

3-51. The front panel BRIGHTNESS control R78 maintains the control grid of cathode-ray tube V75 at the proper negative potential with respect to the cathode. The front panel FOCUS control R79 adjusts the potential on grids 2 and 4, causing convergence of the electron beam on the screen of the cathode-ray tube. The accelerating anode is connected directly to the +2,400 volt supply.

3-52. TUNING UNIT MECHANICAL DRIVE SYSTEM.

3-53. Each of the five tuning units contains a precision UNIDIAL ® drive mechanism for simultaneous tracking of the local oscillator with tuning dial rotation. The precision mechanical drive consists of a main drive shaft and tuning cam which converts the rotational motion imparted by the TUNING control to the transitional motion necessary for varying the position of the contact-type short of the transmission line oscillator, and a non-contacting type short of the external-cavity reflex klystron. In tuning unit models STU-2WA through STU-4WA a second cam is used to actuate a mode switching microswitch. This cam is mounted on the shaft of the reflector tracking potentiometer which is driven by the main drive shaft via an idler gear. Tuning unit model STU-5WA does not require mode switching since single mode operation of the cavity covers the entire frequency range of the unit. In this case only the tracking potentiometer is driven by the main drive shaft via the idler gear.

SECTION IV

MAINTENANCE

4-1. GENERAL.

4-2. This section contains a list of the test equipment required for maintenance, the minimum performance standards that are used to ascertain equipment capability, the procedures for system and detailed troubleshooting, disassembly and reassembly instructions, alignment and calibration procedures, and lubrication data for the Model TSA-W. Section V, Diagrams, contains schematic, cabling and voltage and resistance diagrams to be used in conjunction with the procedure given in this section. Section VI, Parts List, contains a complete parts list for the Model TSA-W.

4-3. TEST EQUIPMENT REQUIRED.

4-4. Table 4-1 lists and describes applications of test equipment required for Model TSA-W maintenance. Test equipment of equivalent characteristics can be substituted for the items listed in the table.

TABLE 4-1. TEST EQUIPMENT REQUIRED

Test Equipment Name, Model and Manufacturer	Application
Volt-ohm-milliammeter multimeter, Model 260, Simpson Electric Co.	Voltage and resistance measurements
Oscilloscope, Model 130B, Hewlett-Packard Co.	Checking waveforms and tuning unit
Voltmeter, vacuum-tube type, Model WV98A, Radio Corp. of America	Checking voltages at high impedance points
RF Signal Generator, Model 65B, Measurements Corp.	Checking narrow band i-f amplifier
RF Signal Generator, Model 80, Measurements Corp.	Checking the narrow band amplifier, sweep generator, and marker oscillator
Frequency Counter, Model 524, Hewlett-Packard Co.	Checking narrow-band
RF Signal Generator, Model 608C/D, Hewlett-Packard Co.	Checking tuning unit
RF Signal Generator, Model MSG-2R, Polarad Electronics Corp.	Checking tuning unit
Crystal Calibrator, Model 111B, Measurements Corp.	Checking the sweep generator
Sweep Generator, Model H3, Telonic Industries Inc.	Checking wide band amplifier
Wavemeters, Models N410A and H410A, FXR Inc.	Checking tuning unit
Klystron Mode Alignment Modulator, Model MK-1, Polarad Electronics Corp. (See figure 4-9)	Checking tuning unit
Audio Oscillator, Series 200, Hewlett-Packard Co.	Checking video gain

4-5. MINIMUM PERFORMANCE STANDARDS.

4-6. Tables 4-2a and 4-2b list the minimum performance standards for the Model TSA-W. The purpose of the minimum performance standards is to determine if the equipment is operating satisfactorily and is ready for use. Figure 4-1 is a block diagram showing waveshapes at specific points to aid in locating trouble. If excessive signal levels are required at any point, the trouble is between that point and the point previously checked.

TABLE 4-2a. MINIMUM PERFORMANCE STANDARDS

Step	Purpose	Procedure	Normal Indication	Abnormal Indication Reference
1	Determine whether power is being applied	Place ON-OFF switch in the ON position	Power indicator illuminated; screen scale illuminated; blower fan on	Table 4-3, Step 1
2	Determine scale illumination variation	Rotate the SCALE ILLUM control thru its full range	Screen scale illumination varies from off to maximum intensity	Table 4-3, Step 2
3	Determine whether CRT display is operating	a. Rotate the VERT POS and the HOR POS controls thru their full range	a. Sweep trace moves up or down and left or right	Table 4-3, Step 3
		b. Using the controls stated in a, above, position sweep trace so that it lies one inch below horizontal center and is vertically centered on screen. Adjust BRIGHTNESS and FOCUS controls for a sweep trace of suitable brightness and sharpness	b. Sweep trace is sharpened and retrace disappears	
		c. Rotate the HOR GAIN control through its full range	c. Sweep length narrows or expands, depending on direction of rotation	Table 4-3, Step 5
		d. While applying a low-level signal to the DIRECT INPUT jack on the Rf Tuning Unit, rotate the VERT GAIN control through its full range	d. Pattern height increases or decreases, depending on direction of rotation	Table 4-3, Step 6
		e. Set the HOR GAIN control for a four-inch wide trace. Rotate the SWEEP SPEED control through its full range	e. Sweep trace frequency varies from low frequency (1 cps) with flicker to high frequency (30 cps) without flicker	Table 4-3, Step 7

(Cont'd)

TABLE 4-2a. MINIMUM PERFORMANCE STANDARDS (Cont'd)

Step	Purpose	Procedure	Normal Indication	Abnormal Indication Reference
4	Determine whether marker oscillator is operating	a. Energize marker oscillator by rotating the MARKER AMPLITUDE control	a. Marker pip height varies from zero to maximum; also height of pip is determined by setting of VERT GAIN control	Table 4-3, Step 8
		b. Rotate COARSE FREQUENCY DIFFERENCE-MCS TUNING control fully CW and CCW starting from "0" position	b. Marker pip moves from center to extreme left of screen and back through center to extreme right of screen	Table 4-3, Step 9
5	Determine the characteristics of the DISPERSION control	Adjust the COARSE FREQUENCY DIFFERENCE-MCS TUNING control until pip is centered on screen. Rotate the DISPERSION control through its full range	Width of marker pip varies	Table 4-3, Step 10
6	Determine the characteristics of the BANDWIDTH control	a. Apply a 160 mc c-w signal to the I-F INPUT connector. Rotate BANDWIDTH control fully CW (80 Kc/s position)	a. A response curve as shown in figure 4-2 appears	Table 4-3, Step 11
		b. With the signal still being applied rotate the BANDWIDTH control fully CCW (1 Kc/s position)	b. A nearly symmetrical reduction of the curve occurs. The resultant curve is shown in figure 4-3. The center line of the curve may move to the left slightly	

TYPICAL TUNING UNIT

APPLIED RF SIGNAL

CRYSTAL MIXER

LOCAL OSCILLATOR

160 MC P701

W90

STU-1WA
10-1000MC (FIG. 5-6)

STU-2WA
910-2200MC
1980-4560MC (FIG. 5-7)

STU-3WA
4370-11,000MC
8900-22,000MC (FIG. 5-8)

STU-4WA
21,000-33,000MC (FIG. 5-9)

STU-5WA
33,000-44,000MC (FIG. 5-10)

WIDE BAND I F AMPLIFIER

J701

I-F AMPLIFIER V701

160MC

I-F AMPLIFIER V702 THROUGH V704

J702

(SCHEMATIC FIG. 5-1)

J703

P703

120-200MC

+125V

P/O P301 B

P/O J301

S301

OFF

R304

MARKER OSCILLATOR V301

(SCHEMATIC-FIG. 5-1)

MARKER OSCILLATOR

P702

PREAMP OUTPUT

FRONT PANEL CABLE

I-F INPUT

J85 P85 W80 P86 J86

W89

FRONT PANEL JACKS

W88

P404

SWEEPER

J404

MIXER AND I-F AMPLIFIER V408

J403

224MC

LOW DISPERSION OSCILLATOR V409

HIGH DISPERSION OSCILLATOR V405 AND V406

DRIVER V403

J402

P402

W85

P501

(SCHEMATIC-FIG. 5-1)

P403 64MC P201

W87

J201

I-F AMPLIFIER V201

64MC

J75

SYNC INPUT

OFF

LINE

EXT

TO C115

S76

R804A

BANDWIDTH

R804B

DISPERSION

J501

8

11

9

4

TO V409

+300V

3

TO V405 & V406

2

10

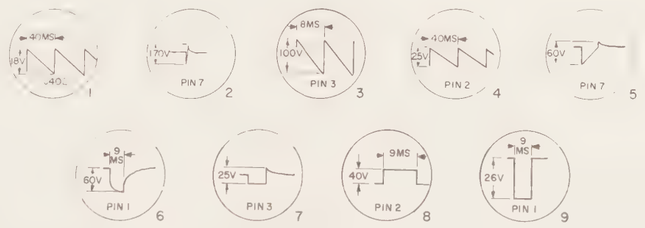
115V AC

P/O K501

COARSE R586A

FINE R586B

CENTER FREQUENCY



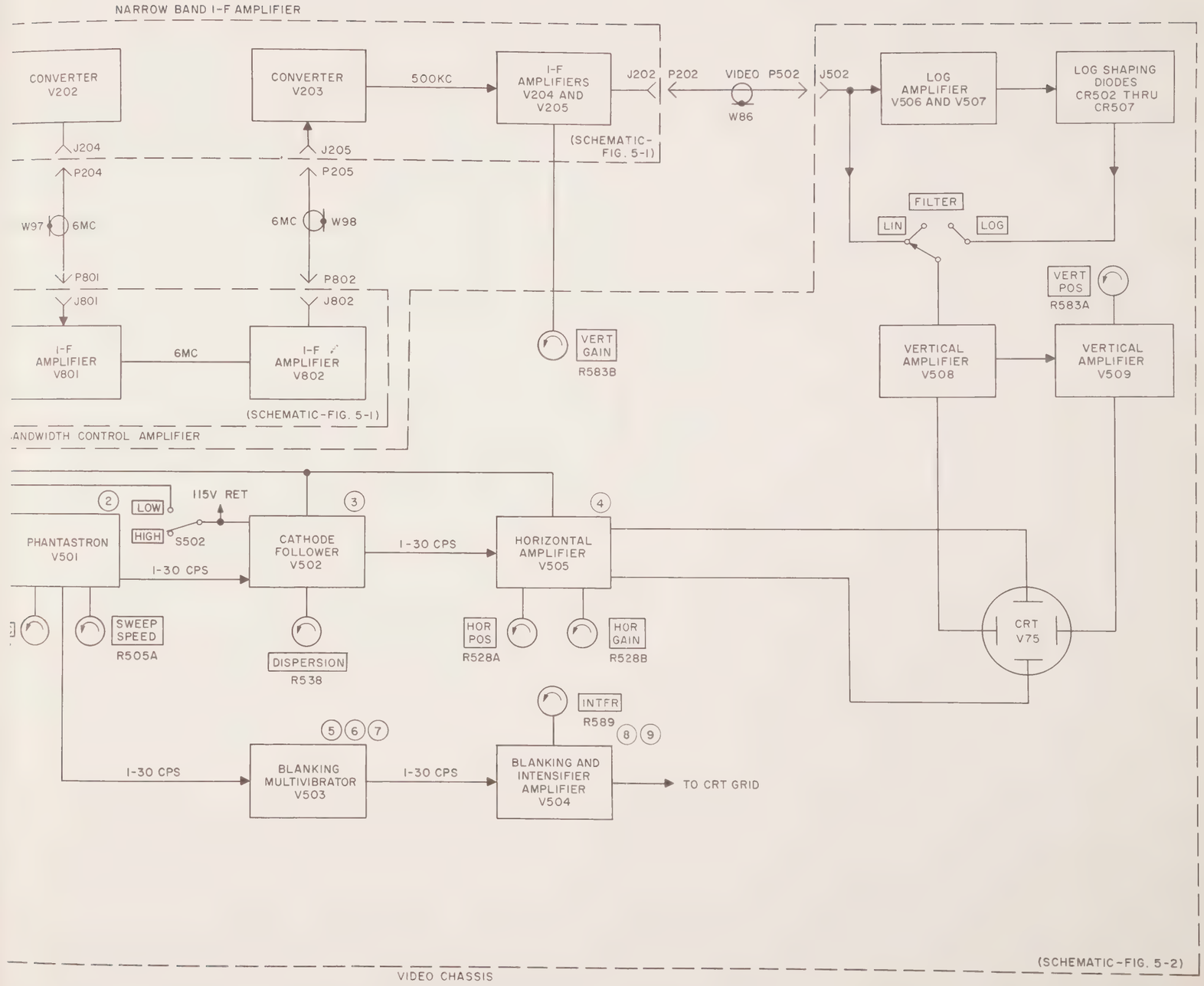


Figure 4-1. Block Diagram Showing Signal Levels

TABLE 4-2b. MINIMUM PERFORMANCE STANDARDS

Circuit	Input Signal	Applied to	Normal Vertical Deflection on CRT
Vertical Amplifier	1000 cps, 4.5 volts peak-to-peak .45 ?	J502	10 cm.
Narrow Band	64 mc (nominal) 30% modulation at 1000 cps 150uV. adjust to 4-5	J201	2 cm.
Sweeper	160 mc. 25 uV	J404	2 cm.
Wide Band	160 mc. 2 uV .10 ?	J701	Signal plus Noise equal to Twice Noise

The above checks are made with the following panel control settings:

VERT GAIN	Maximum CW
BANDWIDTH	Maximum CW
DISPERSION HIGH-LOW	Low
DISPERSION CONTROL	Maximum CW
LOG-FILTER-LIN switch	LIN
SWEEP SPEED	Maximum CW

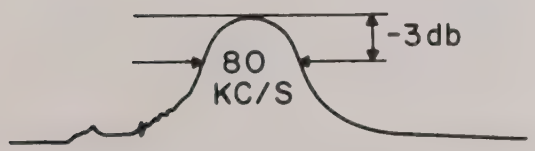


Figure 4-2. Response Curve for Variable Bandwidth If Control Amplifier With Bandwidth Control Set Fully Cw (80 kc/s position)

Figure 4-3. Response Curve for Variable Bandwidth If Control Amplifier With Bandwidth Control Set Fully Ccw (1 kc/s position)

4-7. SYSTEM TROUBLESHOOTING.

4-8. The system troubleshooting procedure for the Model TSA-W is given in table 4-3. The procedure follows the normal operational sequence for Model TSA-W. The probable causes for the symptoms listed are given in the order of their probability of occurrence.

TABLE 4-3. SYSTEM TROUBLESHOOTING

Step	Symptom	Probable Cause	Remedy
1	POWER indicator does not light when ON-OFF switch is set at ON	No ac power input	Check ac line
			Check power cord
			Check power cord connection to equipment
		Fuses F101 and/or F102 open	Replace defective fuses
		POWER indicator DS76 defective	Replace lamp in DS76
		ON-OFF switch S75 defective	Replace switch S75
		Component defective	Refer to table 4-4, step 1
2	Screen scale illumination is off or does not vary when SCALE ILLUM control is rotated	SCALE ILLUM control R77 defective	Replace defective control
3	No sweep trace on screen	Cables are not connected to chassis	Check for proper cable connections. See figure 5-5
		Component defective	Refer to table 4-4, step 3
4	Sweep trace is not affected when BRIGHTNESS and FOCUS controls are adjusted	BRIGHTNESS and FOCUS controls R78 and R79 respectively are defective	Replace controls R78 and R79
		Components defective	Refer to table 4-4, step 3
5	Sweep length fails to decrease or increase as the HOR GAIN control is rotated	HOR GAIN control R528B is defective	Replace control R528B
		Component defective	Refer to table 4-4, steps 4 and 5
6	Pattern height of applied signal is not affected by the rotation of the VERT GAIN control	VERT GAIN control R583B is defective	Replace control R583B
		Component defective	Refer to table 4-4, step 5
7	Sweep trace frequency does not vary when the SWEEP SPEED control is rotated	SWEEP SPEED control R505A is defective	Replace control R505A
		Component defective	Refer to table 4-4, step 6
8	No marker pip or marker pip remains at a set height when rotating the MARKER AMPLITUDE control	MARKER AMPLITUDE control R304 and/or switch S301 are defective	Replace control R304 and/or switch S301

(cont'd)

TABLE 4-3. SYSTEM TROUBLESHOOTING (Cont'd)

Step	Symptom	Probable Cause	Remedy
9	Marker pip does not move when the FREQUENCY DIFFERENCE MCS COARSE and/or VERNIER controls are rotated	FREQUENCY DIFFERENCE MCS COARSE and/or VERNIER controls C302 and/or C312 are defective	Replace control C302 and/or C312 or repair its mechanical drive
10	Width of marker pip does not change when the DISPERSION control is rotated	DISPERSION control R538 is defective	Replace control R538
		Component defective	Refer to table 4-4, step 6
11	Response curves as shown in figures 4-2 and 4-3 are not present when the BANDWIDTH control is placed in the extreme CW and CCW positions, respectively	BANDWIDTH control R804 is defective	Replace control R804
		Component defective	Refer to table 4-4, step 9
		Variable resolution amplifier is misaligned	Align variable resolution amplifier (see paragraph 4-34)

4-9. DETAILED TROUBLESHOOTING.

4-10. The detailed troubleshooting procedure for the Model TSA-W is given in table 4-4. If the trouble has been localized to a single assembly or circuit during system troubleshooting, start the detailed troubleshooting at the step referenced in table 4-3. If the location of the trouble is indefinite or cannot be localized to a single assembly or circuit, start the detailed troubleshooting at the step that most closely resembles the trouble encountered.

4-11. Use the diagrams in Section V and the parts list in Section VI to supplement the detailed troubleshooting procedure of table 4-4.

4-12. DISASSEMBLY AND REASSEMBLY INSTRUCTIONS. (See figures 4-4 through 4-7.)

4-13. The Model TSA-W should only be disassembled to the extent necessary to effect replacement or repairs.

4-14. DUST COVER REMOVAL. Access to all major assemblies and components mounted on the main chassis is obtained by removal of the dust cover. To remove the dust cover, proceed as follows:

a. At the rear of the dust cover, release the four fasteners by turning them a half-turn counterclockwise.

b. Grasp the handles on the tuning unit and pull the chassis out of the dust cover.

4-15. TUNING UNITS REMOVAL. Access to the components of the rf tuning units is obtained by removing them from the main chassis. To remove a unit, proceed as follows:

a. At the tuning unit front panel, rotate the four captive screws CCW until they are free.

b. Grasp the handles on the tuning unit and carefully manipulate the unit out of the main chassis.

c. The unit is electrically disconnected from the main chassis by removing receptacle P104 from its mating multi-pin connector J104, and coaxial cable W90.

TABLE 4-4. DETAILED TROUBLESHOOTING

Step	Trouble	Troubleshooting Procedure
1	Power input circuit open	Check continuity of transformer T101 terminals 1-3 and 4-7
2	Rf tuning unit fails to operate	Check time delay relay K101 using Model WV98A voltmeter
		Check rectifier tubes V101 and V102
		Check capacitors C101 and C102 for short using Model 260 multimeter
		Check transformer T103 for continuity (see figure 5-3)
		Check tubes V103 thru V110 and associated circuitry
		Check the 4 rectifiers in the bridge CR110
		Check and adjust, if required, control R117 or R123 depending upon tuning head in use, using Model 260 multimeter. (see paragraph 4-27) Measurement and adjustment are made at the rear of main chassis (see figure 4-4)
3	Low intensity of spectrum or no trace	Check transformer T603 for continuity (see figure 5-3)
		Check tubes V616, V617 and V618 and associated resistors and capacitors using Model 260 multimeter
4	HOR GAIN and HOR POS control do not affect trace	Check tube V505 and associated resistors and capacitors using Model 260 multimeter
5	VERT GAIN and VERT POS controls do not affect trace	Check amplifier tubes V508 and V509 and associated resistors and capacitors using Model 260 multimeter
6	DISPERSION and SWEEP SPEED controls do not affect trace	Check sawtooth generator tubes V501 and V502 and associated resistors and capacitors using Model 260 multimeter
7	MARKER AMPLITUDE control does not affect trace	Check marker oscillator V301 and associated resistors and capacitor using Model 260 multimeter
8	CENTER FREQUENCY control does not affect marker pip	Check sweep frequency generator tubes V405, V403, V406, V408 and V409 and associated resistors and capacitors using Model 260 multimeter
		Check controls R585 and R587 (see figure 5-7)
9	Display on crt screen fails to reduce symmetrically when the BANDWIDTH control is rotated from maximum CW to maximum CCW position	Check tubes V801 and V802 and associated resistors and capacitors using Model 260 multimeter and tuning of C802, C803, T801, T802.
		Check narrow band i-f amplifier tubes V201 through V205 and associated resistors and capacitors using Model 260 multimeter and tuning

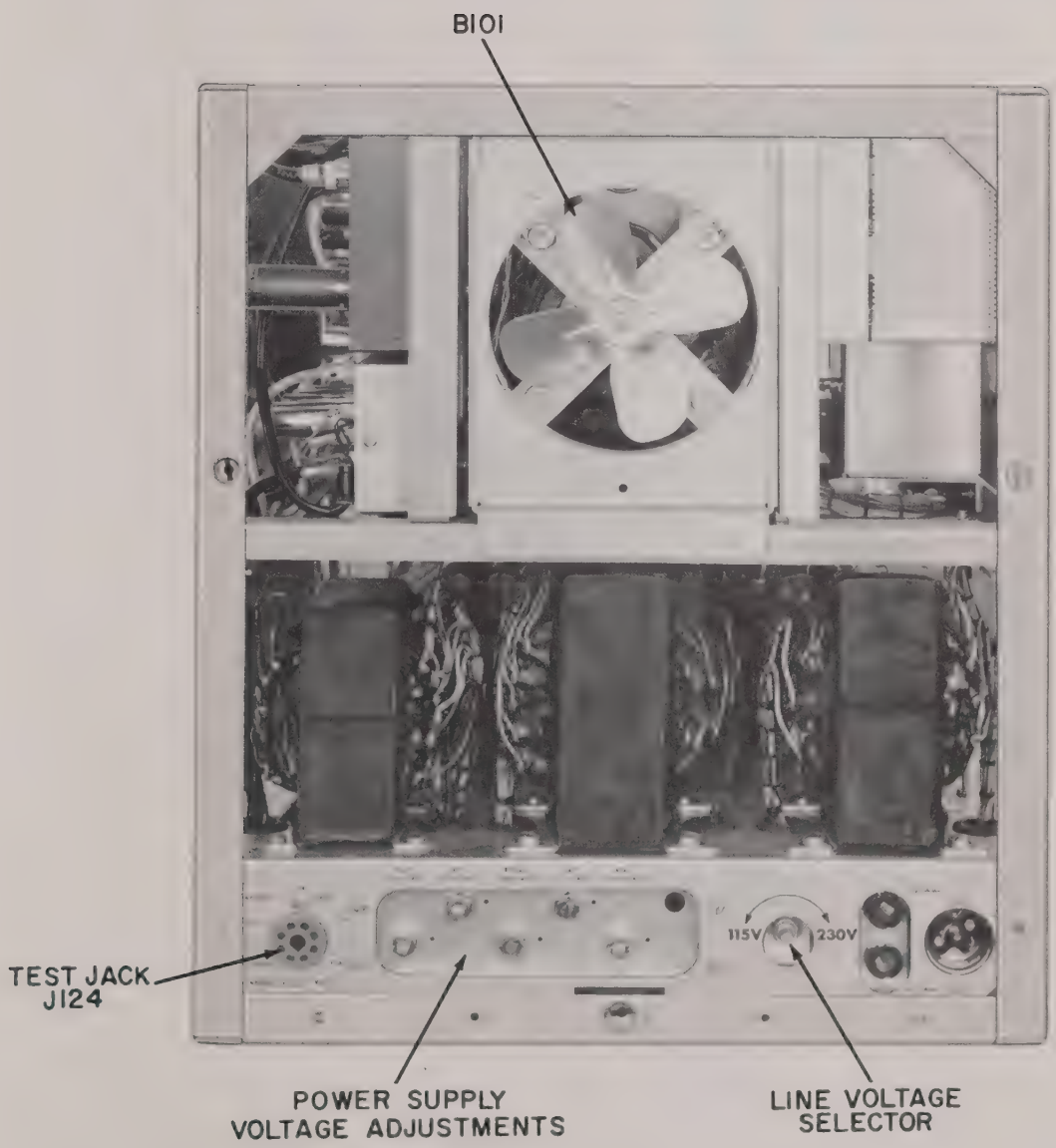


Figure 4-4. Rear View, Model DU-2A

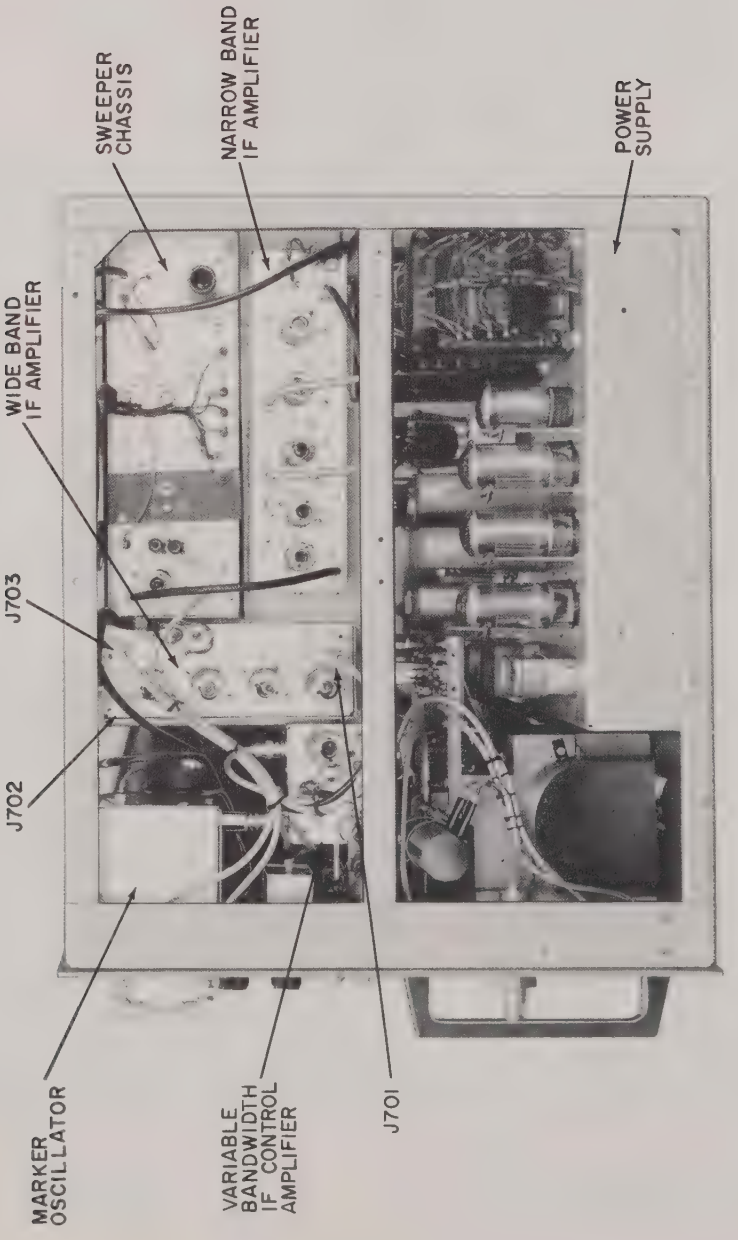


Figure 4-5. Right Side View, Model DU-2A

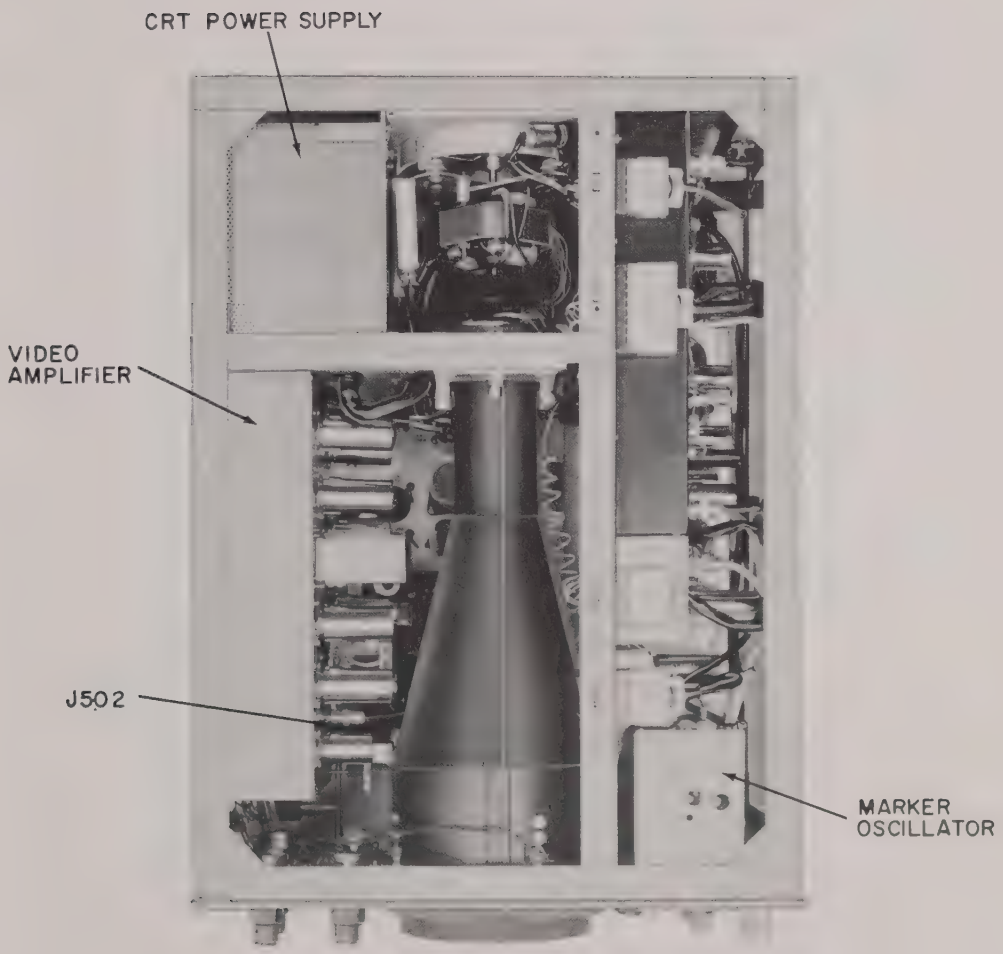


Figure 4-6. Top View, Model DU-2A

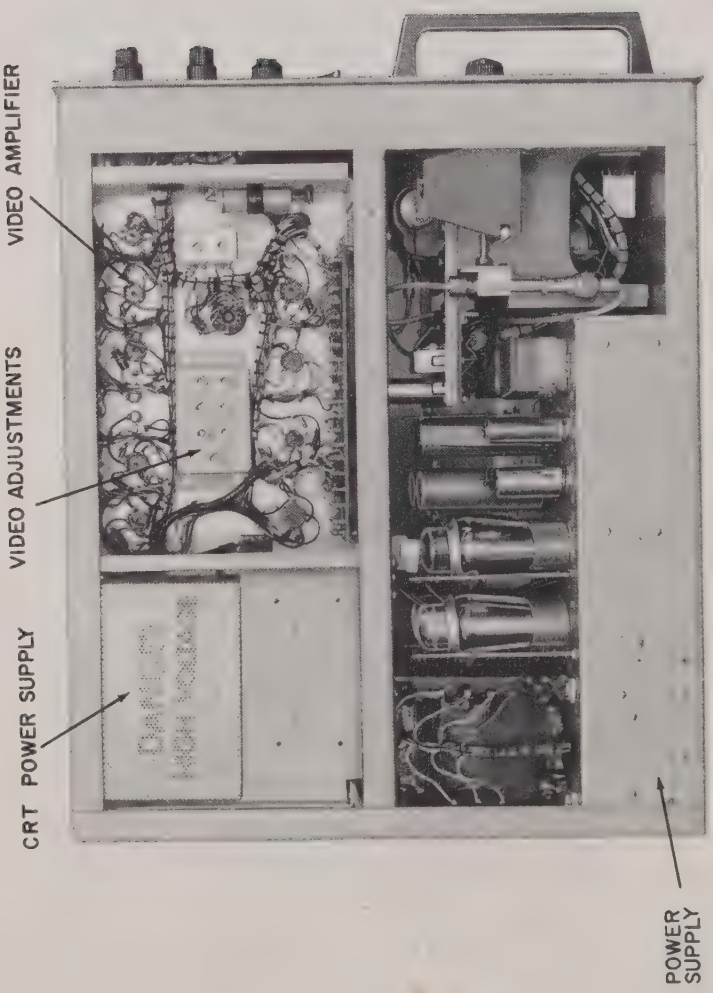


Figure 4-7. Left Side View, Model DU-2A

4-16. KLYSTRON TUBE REPLACEMENT.

4-17. The klystron tube is partially seated within the oscillator cavity which is assembled on the casting directly behind the tuning head front panel.

4-18. REMOVAL OF KLYSTRON TUBE. The operating power must be switched off before attempting klystron tube removal.

a. Remove the RF Tuning Unit from the basic unit.

b. Remove the breeze clamp holding the klystron protective cover to the klystron retainer nut. Slide the cover back.

c. Gently pull the tube socket assembly off the base of the klystron tube.

d. Use the spanner wrench supplied to loosen the large knurled retaining collar. Do not remove it completely.

e. Grasp the projecting end of the klystron tube, gently rotating it in a clockwise direction while simultaneously withdrawing the tube from its retaining springs within the cavity.

4-19. INSERTION OF REPLACEMENT KLYSTRON. The tube must be handled with extreme care to avoid damage.

a. Insert the tube carefully into the cavity, gently rotating the tube clockwise as the tube is pressed in, until it meets a positive stop. In the STU-2WA there will be one noticeable click as the tube passes its retaining spring. In the STU-3WA, STU-4WA and STU-5WA, there will be two noticeable clicks.

b. Retighten the large knurled retaining collar, using the spanner wrench.

c. Connect the tube socket to the base of the klystron tube. Use care to avoid breaking or bending the tube pins as the socket can be forced on in the wrong position. Pin No. 1 is the one separate from the other three.

d. Replace the klystron protective cover by fastening it in place with the breeze clamp.

e. Rotate the Anode Current Adjust control to its extreme CCW position.

4-20. KLYSTRON ANODE CURRENT ADJUSTMENT. Before making the current adjustment, check the Anode voltage from test jack J124 pin 8 to ground. Model STU-2WA should be -325 volts. Models STU-3WA, STU-4WA and STU-5WA should be -1250 volts. If incorrect refer to table 4-6 for adjustment.

4-21. MODEL STU-2WA

a. For klystron type 6BM6 rotate the Anode Current Adjust control to its extreme CCW position.

b. For klystron type 5837 connect the multimeter from R801 pin 1 to R801 pin 2 (pin 2 is +). Set the Anode Current Adjust (R801) for 10 volts.

4-22. MODELS STU-3WA, STU-4WA and STU-5WA. Connect the multimeter from pin 5 of test jack J124 (located at the bottom rear of the basic unit) and ground (pin 5 is +). Set Anode Current Adjust for 3.2 volts.

4-23. KLYSTRON FREQUENCY ALIGNMENT. Connect the test equipment as shown in figure 4-8.

a. Rotate the TUNING knob to the following frequencies and measure the oscillator frequency. Set the wavemeter pip at the center of the mode.

Unit	Dial Freq.	Osc. Freq.
STU-2WA	1600 mc	1760 mc
STU-3WA	8000 mc	8160 mc
STU-4WA	27, 500 mc	9220 mc
STU-5WA	39, 000 mc	9790 mc

b. Rotate the TUNING knob to the low frequency end and measure the oscillator frequency. Set the wavemeter pip at the center of the mode.

Unit	Dial Freq.	Osc. Freq.
STU-2WA	910 mc	1070 mc
STU-3WA	4370 mc	4580 mc
STU-4WA	21, 000 mc	7053 mc
STU-5WA	33, 000 mc	8290 mc

c. Rotate the TUNING knob to the high frequency end and measure the oscillator frequency. Set the wavemeter pip at the center of the mode.

Unit	Dial Freq.	Osc. Freq.
STU-2WA	4500 mc	4660 mc
STU-3WA	11, 000 mc	11, 160 mc
STU-4WA	33, 000 mc	11, 053 mc
STU-5WA	44, 000 mc	11, 040 mc

d. If the measured oscillator frequency is within 1% of the above listed oscillator frequency, no further adjustment is necessary.

e. If the frequency accuracy is not within 1%, loosen the setscrew that locks the push-rod adjustment screw and turn the push-rod adjustment screw until the frequency is within 1% for steps a, b, and c.

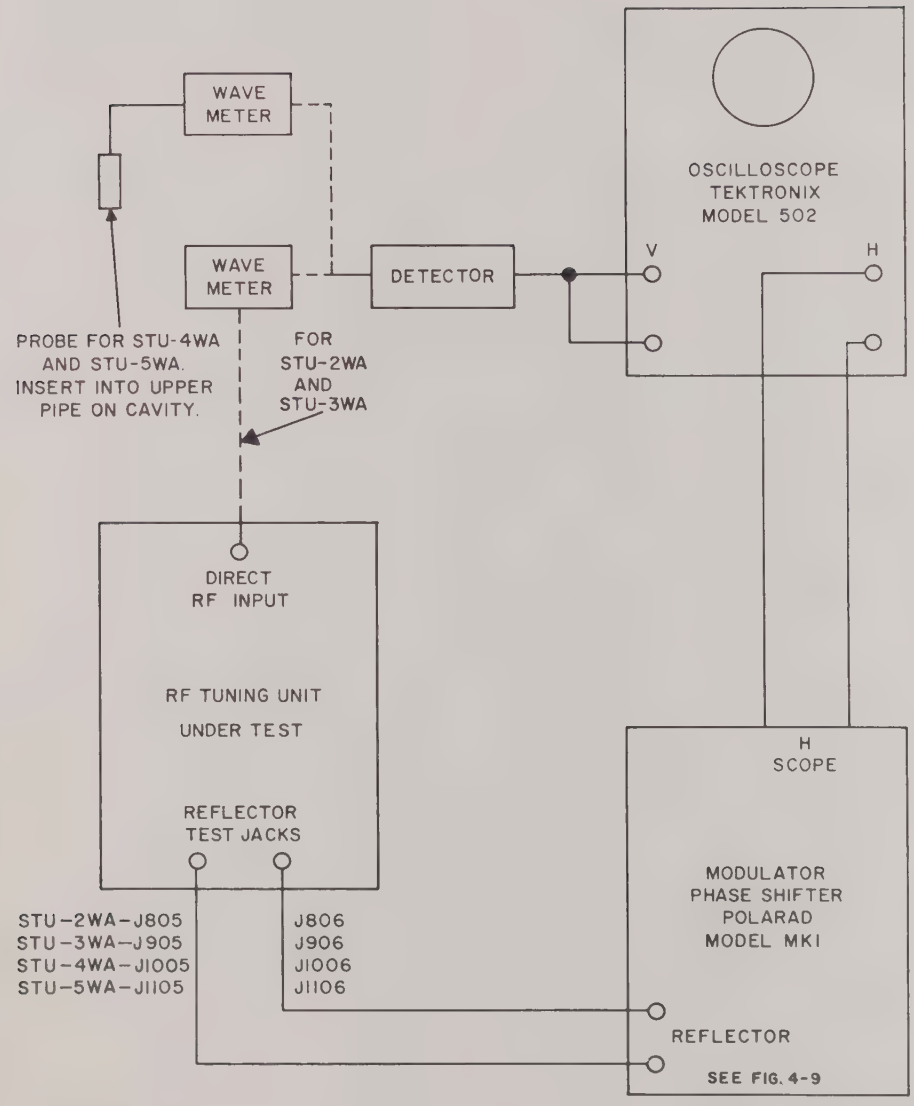


Figure 4-8. Klystron Frequency Test Setup

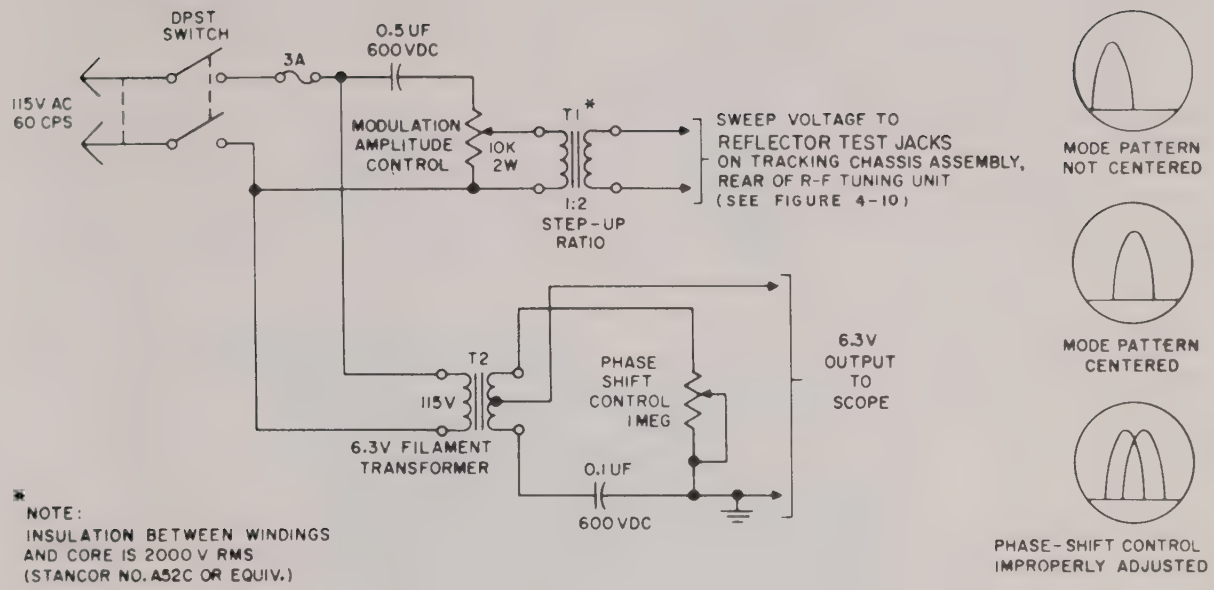

DPST SWITCH
3A
0.5 UF 600 VDC
115 V AC 60 CPS
MODULATION AMPLITUDE CONTROL
10K 2W
T1 *
1:2 STEP-UP RATIO
SWEEP VOLTAGE TO REFLECTOR TEST JACKS ON TRACKING CHASSIS ASSEMBLY, REAR OF R-F TUNING UNIT (SEE FIGURE 4-10)
T2
115 V
6.3 V FILAMENT TRANSFORMER
PHASE SHIFT CONTROL 1 MEG
0.1 UF
600 VDC
6.3 V OUTPUT TO SCOPE
* NOTE: INSULATION BETWEEN WINDINGS AND CORE IS 2000 V RMS (STANCOR NO. A52C OR EQUIV.)
MODE PATTERN NOT CENTERED
MODE PATTERN CENTERED
PHASE-SHIFT CONTROL IMPROPERLY ADJUSTED

Figure 4-9. Modulator and Phase Shifting Circuits, Schematic Diagram

4-24. KLYSTRON REPELLER TRACKING VOLTAGE ADJUSTMENT. Connect the test equipment as shown in figure 4-11.

a. Rotate the TUNING knob to set the frequency dial to the high end.

b. Adjust HIGH LIMIT so that the mode is centered on the trace (See figure 4-10).

c. Rotate the TUNING knob to the high frequency side of the mode switch.

Unit	Mode Switch Frequency
STU-2WA	1400 mc
STU-3WA	7850 mc
STU-4WA	23,800 mc
STU-5WA	No mode switch

d. Adjust HIGH MODE so that the mode is centered on the trace.

e. Rotate the TUNING knob to the low frequency side of the mode switch.

f. Adjust LOW MODE so that the mode is centered on the trace.

g. Rotate the TUNING knob to the low frequency end.

h. Adjust LOW LIMIT so that the mode is centered on the trace.

i. Repeat steps a thru h until no further adjustments are necessary.

4-25. ELECTRON TUBE AND SEMICONDUCTOR REPLACEMENT.

4-26. Replacing certain tubes and semiconductors necessitates a check on the alignment or calibration of the section in which the replacement was made. Table 4-5 lists the tubes and semiconductors contained in the Model TSA-W and states what alignment procedure, if any, is necessary when a replacement is made.

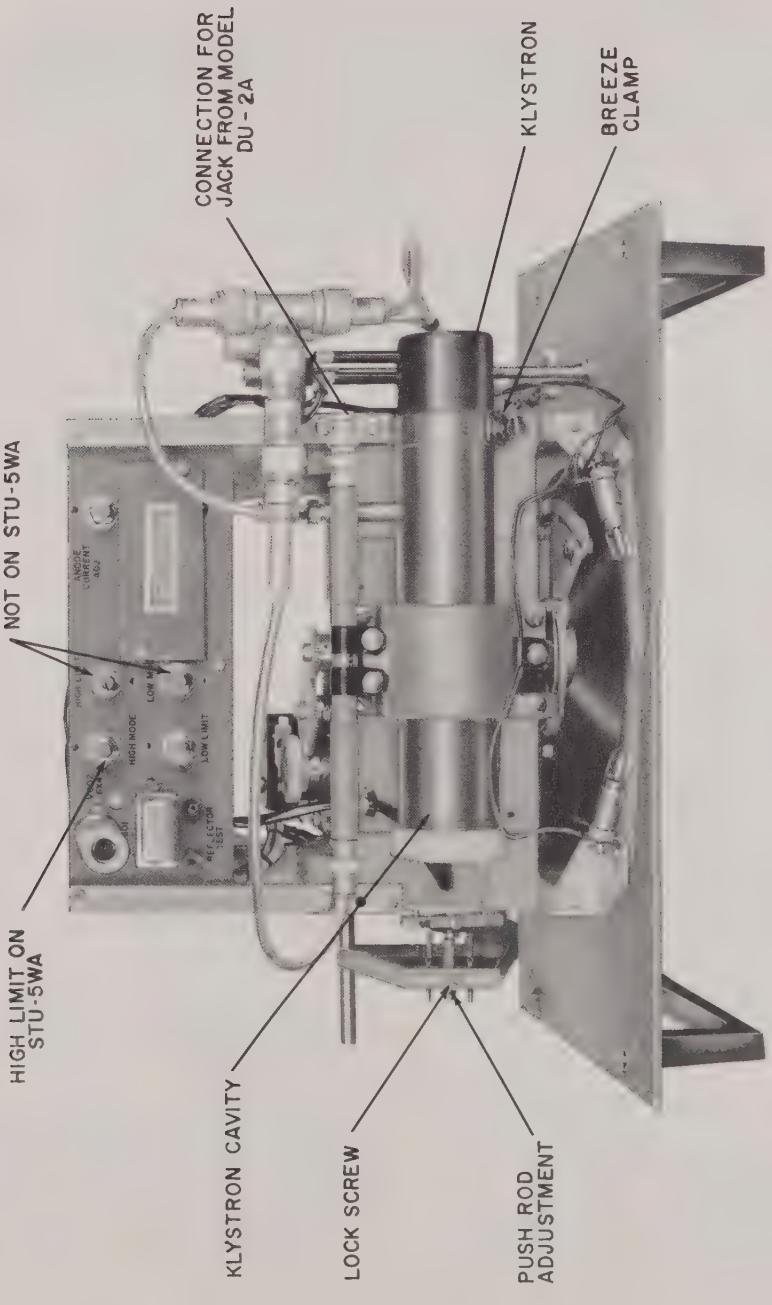


Figure 4-10. Top View of Typical RF Tuning Unit

4-24a. ALIGNMENT OF STU-1WA. In order to align the Model STU-1WA Tuning Head, the following procedure must be followed:

a. To check and align the pre-amplifier filter use the test setup of figure 4-11a.

b. Adjust C656 and C658 for maximum gain and flatness in the 147 mc to 173 mc range. The response curve should be similar to that shown in fig. 4-11b.

c. To check and align the local oscillator use the test setup of figure 4-11c, and the photograph, figure 4-11d.

d. Using the crystal calibrator Model 111B, calibrate the internal marker oscillator of the spectrum analyzer at exactly 160 mc with the dial set at zero.

e. Set the STU-1WA dial at 400 mc (band 1) and tune the Model 80 signal generator to exactly 400 mc. Check this frequency against the crystal calibrator to assure its accuracy.

f. If the frequency difference between the marker oscillator and the 400 mc signal is less than 6 mc, no adjustment is necessary. If not, remove the oscillator housing cover and loosen the two set screws which lock the wiper arm to the rotor shaft. Rotate the wiper arm until the 400 mc signal is super-imposed on that of the internal marker oscillator. Lock the wiper arm to the rotor shaft with the two set screws. The wiper arm should now be near the extreme end of the track.

g. Set the STU-1WA dial to 10 mc and tune the signal generator to exactly 10 mc. Check this frequency against the crystal calibrator to assure its accuracy.

h. If the frequency difference between the marker oscillator and the 10 mc signal is less than 2 mc, no adjustment is necessary. If not, adjust C627 to super-impose the 10 mc signal on that of the marker oscillator.

i. Replace the oscillator housing cover and repeat steps e through h until no further adjustments are necessary.

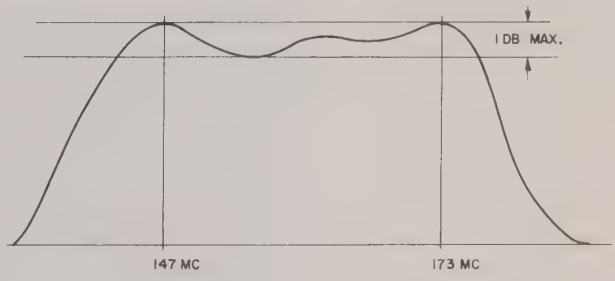


Figure 4-11b. Pre-amplifier Filter Response Curve

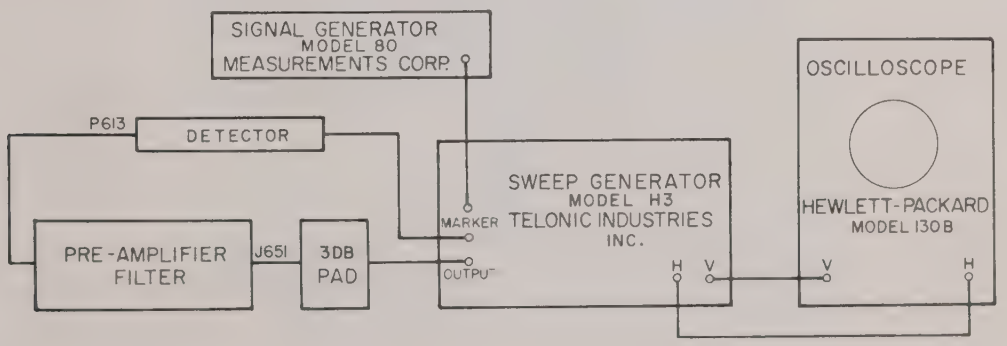


Figure 4-11a. Test Setup for Checking and Aligning Pre-amplifier Filter

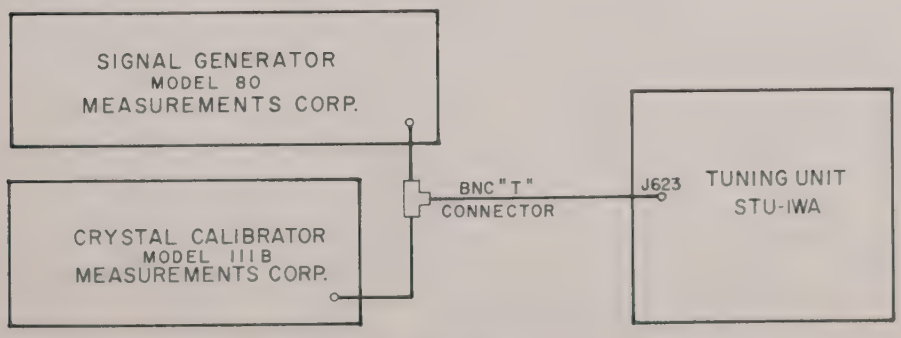


Figure 4-11c. Test Setup for Checking and Aligning the Local Oscillator

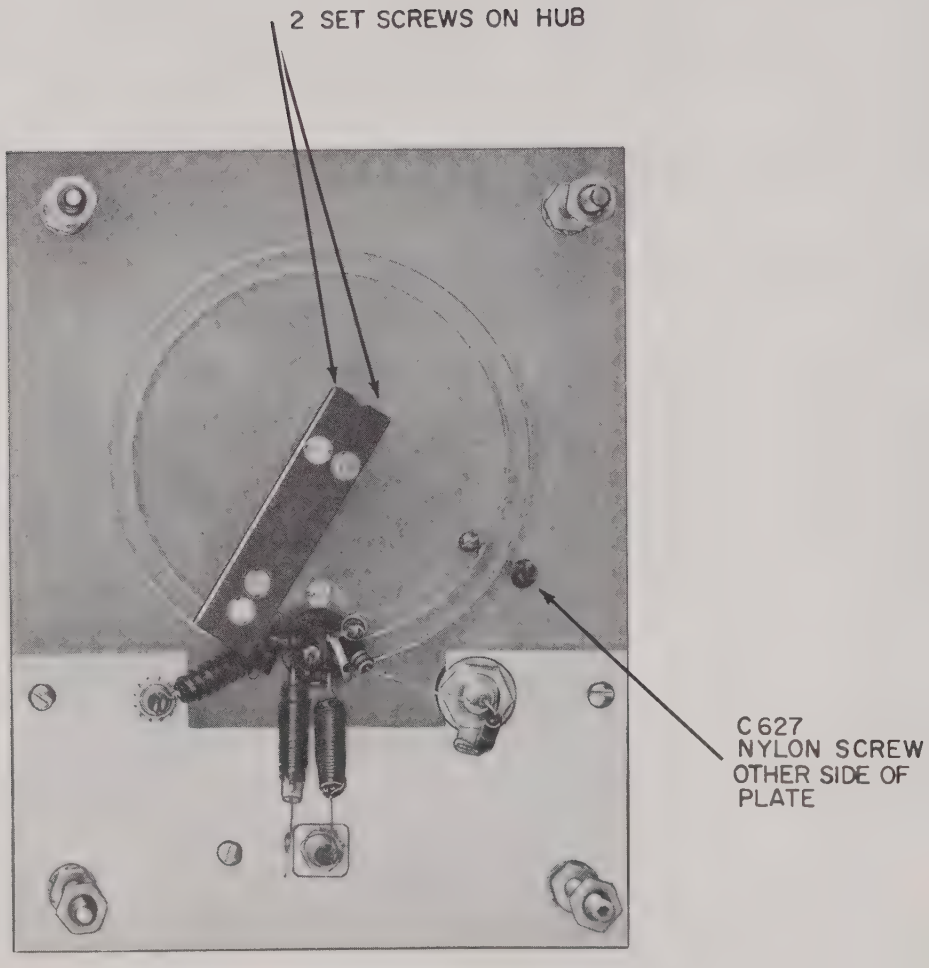


Figure 4-11d. STU-1WA Oscillator Assembly

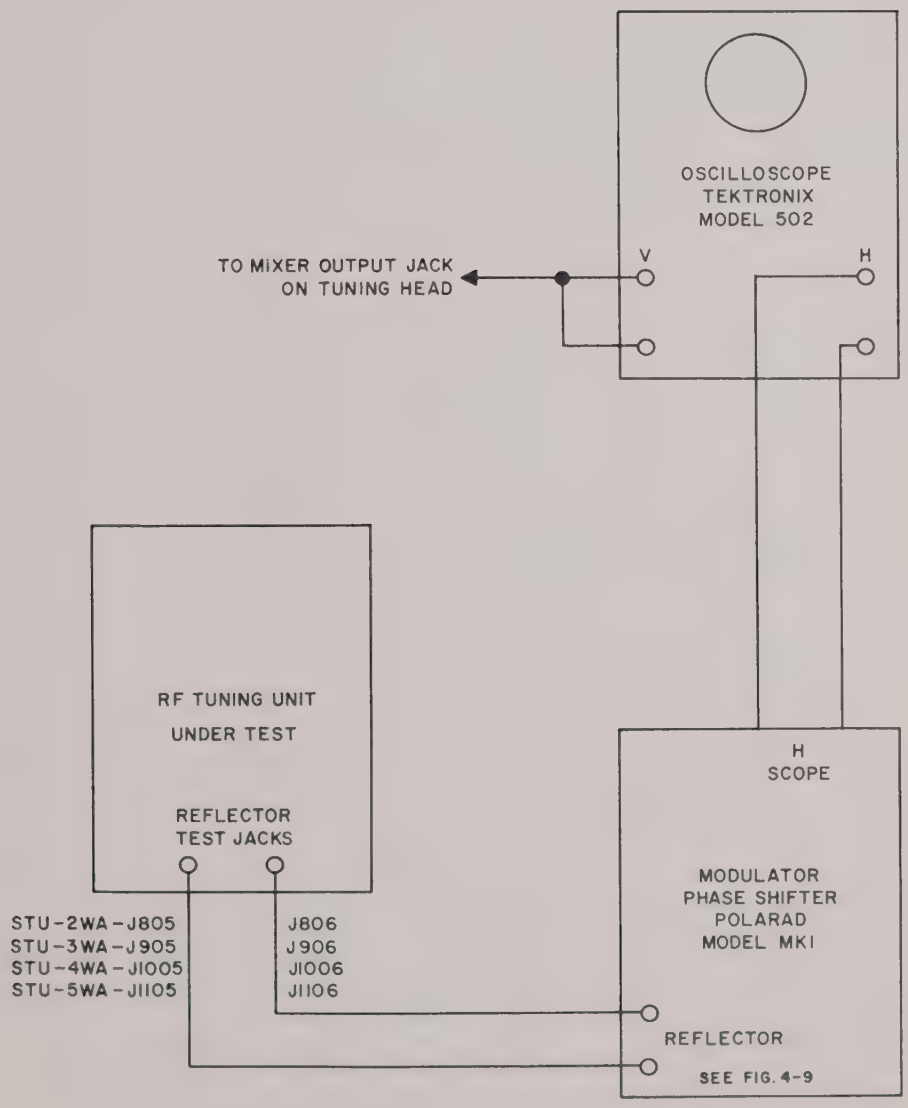


Figure 4-11. Klystron Repeller Tracking Voltage Test Setup

TABLE 4-5. ELECTRON TUBE AND SEMICONDUCTOR REPLACEMENT

Ref. Symbol	Type	Alignment Required After Replacement
		BASIC UNIT DU-2A
V101	5R4	
V102	5R4	
V103	807	
V104	807	Check -1,250 volt and -325 volt power supply adjustments. See paragraph 4-29.
V105	12AX7	
V106 thru V110	OA2	None
V111	6080	Check +125 volt supply. See paragraph 4-29.
V112	5881	Check -150 volt supply. See paragraph 4-29.
V113	6080	Check +300 volt supply. See paragraph 4-29.
V114	6080	Check +125 volt supply. See paragraph 4-29.
V115	12AX7	Check -150 volt supply. See paragraph 4-29.
V116	12AX7	Check +300 volt supply. See paragraph 4-29.
V117	12AX7	Check +125 volt supply. See paragraph 4-29.
V118	5651	None
V201	6AK5	Check narrow band i-f alignment. See paragraph 4-32.
V202	6BE6	Check narrow band i-f alignment. See paragraph 4-32.
V203	6BE6	Check narrow band i-f alignment. See paragraph 4-32.
V204	6AH6	Check narrow band i-f alignment. See paragraph 4-32.
V205	6AH6	Check narrow band i-f alignment. See paragraph 4-32.
V301	5718	Check marker alignment. See paragraph 4-33.
V403	6005	Check sweeper alignment. See paragraph 4-31.
V405 and V406	5718	Check sweeper alignment. See paragraph 4-31.
V408	6AK5	Check sweeper alignment. See paragraph 4-31.
V409	5718	Check sweeper alignment. See paragraph 4-31.
V501	6AS6	None
V502	12AT7	Check horizontal zero adjustment. See paragraph 4-35.

(Cont'd)

TABLE 4-5. ELECTRON TUBE AND SEMICONDUCTOR REPLACEMENT (Cont'd)

Ref. Symbol	Type	Alignment Required After Replacement
V503	12AU7	None
V504	12AU7	None
V505	12AU7	None
V506	6AN8	Check log zero adjustment. See paragraph 4-36.
V507	6AN8	Check log zero adjustment. See paragraph 4-36.
V508	6AH6	Check vertical amplifier gain. See paragraph 4-35.
V509	6AH6	Check vertical amplifier gain. See paragraph 4-35.
V616	6AR6	None
V617 and V618	1Z2	None
V701 thru V704	6922	Check wide band i-f amplifier alignment. See paragraph 4-30.
V801	12AT7	Check alignment of bandwidth control i-f amplifier. See paragraph 4-34.
V802	6AG5	Check alignment of bandwidth control i-f amplifier. See paragraph 4-34.
CR201	1N69	None
CR402	1N82A	Check sweeper alignment. See paragraph 4-31.
CR501	1N69	None
CR502 thru CR507	1N198	Check log zero adjustment. See paragraph 4-36.
CR508	1N198	None
		RF TUNING UNITS
V601	6AF4A	Check Model STU-1WA calibration. See paragraph 4-23.
V801	6BM6, 5837 or ZV1009	Check Model STU-2WA calibration. See paragraph 4-23.
V802	6X4	None
V901	5721	Check Model STU-3WA calibration. See paragraph 4-23.
V902	6X4	None
V1001	5721	Check Model STU-4WA calibration. See paragraph 4-23.

(Cont'd)

TABLE 4-5. ELECTRON TUBE AND SEMICONDUCTOR REPLACEMENT (Cont'd)

Ref. Symbol	Type	Alignment Required After Replacement
V1002	6X4	None
V1101	5721	Check Model STU-5WA calibration. See paragraph 4-23.
V1102	6X4	None
CR601	1N21C	Check Model STU-1WA calibration. See paragraph 4-23.
CR801	1N21B or 1N23C	Check Model STU-2WA calibration. See paragraph 4-23.
CR901	1N26 or 1N78	Check Model STU-3WA calibration. See paragraph 4-23.
CR1001	1N26	Check Model STU-4WA calibration. See paragraph 4-23.
CR1101	1N53	Check Model STU-5WA calibration. See paragraph 4-23.
Q651	PADT30	Check Model STU-1WA calibration. See paragraph 4-23.

TABLE 4-6. POWER SUPPLY ADJUSTMENTS

Supply	Meter Connections	Adjust
-1250	Pin 8 of J124 and ground	Anode volts adj. pot. R123 for -1250 volts
-325*	Pin J of J104 and ground	-325 volt pot. R117 for -325 volts
+125	Pin 6 of J124 and ground	+volt pot. R147 for +125 volts
-150	Pin 3 of J124 and ground	150 volt pot. R154 for -150 volts
+300	Pin 7 of J124 and ground	+300 volt pot. R143 for +300 volts

*Necessary only when using Tuning Unit Model STU-2WA

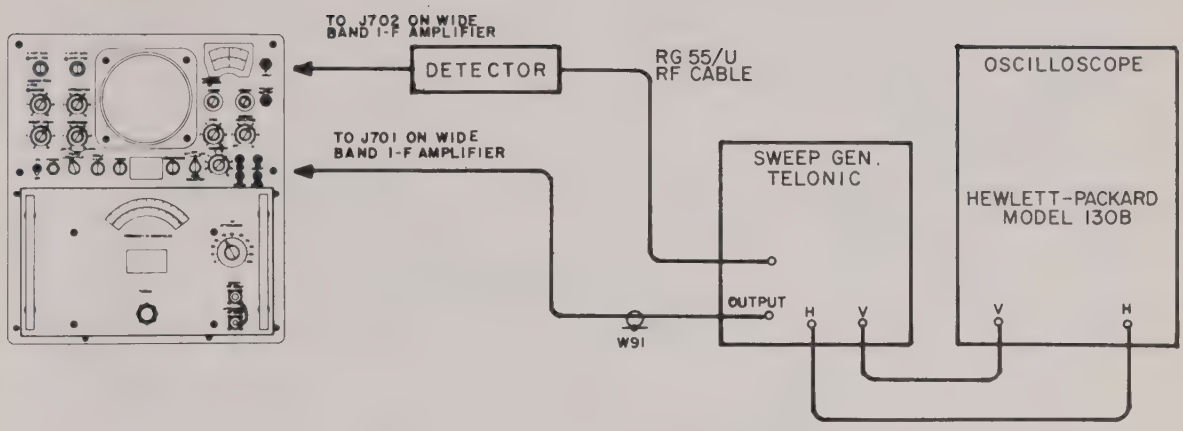


Figure 4-12. Test Setup for Checking and Aligning the Wide Band I-f Amplifier

4-27. ALIGNMENT AND CALIBRATION PROCEDURES.

4-28. The alignment and calibration procedures for the Model TSA-W are given in paragraphs 4-29 through 4-35.

4-29. POWER SUPPLY. The dc power necessary for the operation of the Model TSA-W is supplied by the power supply circuits shown in figure 5-3. The high voltage necessary for the operation of the crt is supplied by a separate high voltage power supply, shown in figure 5-4. The outputs of the power supplies, with the exception of the high voltage supply, are made available at jack J124 located at the rear of the basic unit chassis (see figure 4-4). Any of the supplies may be checked by connecting a VTVM between the proper pin of J124 and chassis ground (see table 4-6). The adjustments may be made in any order except for the -1250 and -325 volt adjustments. In this case the -1250 adjustment must be made before the -325 volt adjustment.

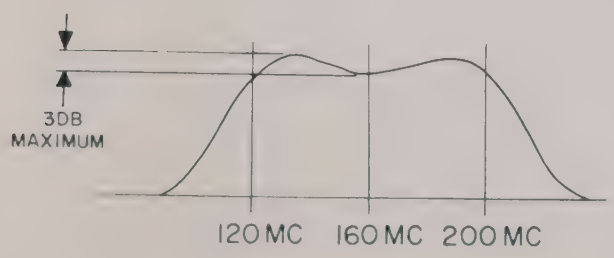


Figure 4-13. Typical Response Curve of the Wide Band I-f Amplifier

4-30. WIDE BAND I-F AMPLIFIER. To check wide band i-f amplifier gain and frequency response, set up the equipment as shown in figure 4-12. Measure the gain of the amplifier over the pass band from 120 to 200 mc. A gain of approximately 25 db at 160 mc indicates satisfactory equipment performance. Failure to obtain this indication shows the need for realignment. Proceed as directed in the following steps:

a. Peak coils L701 through L707 to obtain the response curve shown in figure 4-13.

b. Check the response for a nominal bandwidth of 80 mc (about a center frequency of 160 mc) with a maximum amplitude variation of 3 db over this bandwidth.

c. Disconnect test setup and reconnect cables to J701 and J702.

4-31. SWEEP FREQUENCY GENERATOR. The sweep frequency generator converts the sawtooth output of the phantastron generator into a swept frequency signal centered at 224 mc. A deviation in

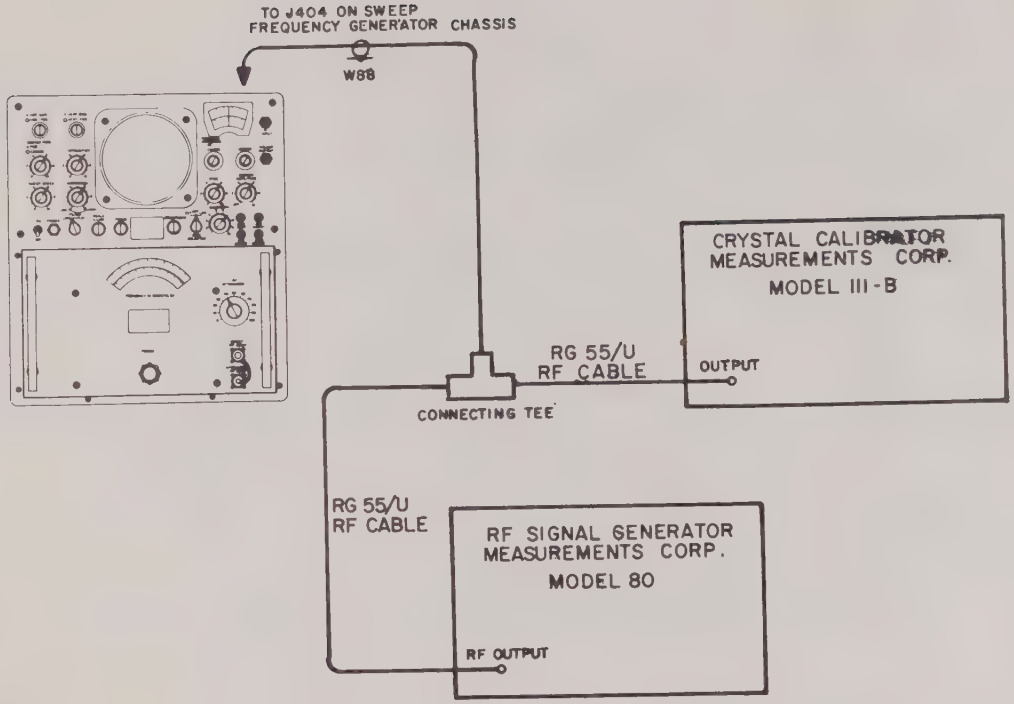


Figure 4-14. Test Setup for Checking and Aligning the Sweep Frequency Generator

linearity of the signal indicates that the sweep frequency generator needs alignment. To align the sweep frequency generator, proceed as follows:

a. Set up the equipment as shown in figure 4-14.

b. Tune the Model 80 to 160 mc and set the DISPERSION switch at High.

c. Adjust L408, L401, and L409 (figure 4-6) for maximum deflection on the CRT.

d. Set the Model 111-B for 10 mc markers.

e. Adjust R403 and CENTER FREQUENCY control for best frequency linearity and proper frequency range as shown in figure 4-15, taking special note of trace foldover.

f. With the CENTER FREQUENCY control adjusted for 160 mc in the center of the trace set the DISPERSION switch to Low.

g. Set the Model 111-B to 1 mc markers.

h. Adjust L406 for best linearity with 160 mc at the center of the trace.

i. Disconnect test setup and reconnect cable to J404.

4-32. NARROW BAND I-F AMPLIFIER. To check the narrow band i-f amplifier, use the test setup of B, figure 4-16. Measure the sensitivity of the amplifier at 64 mc for a 2 cm deflection on the crt, which should be obtained with 150 microvolts input. Failure to obtain the required deflection shows the need for realignment. Proceed as follows:

a. Set up the test equipment as shown in A, figure 4-16.

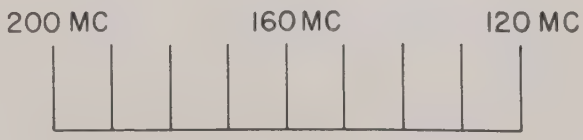
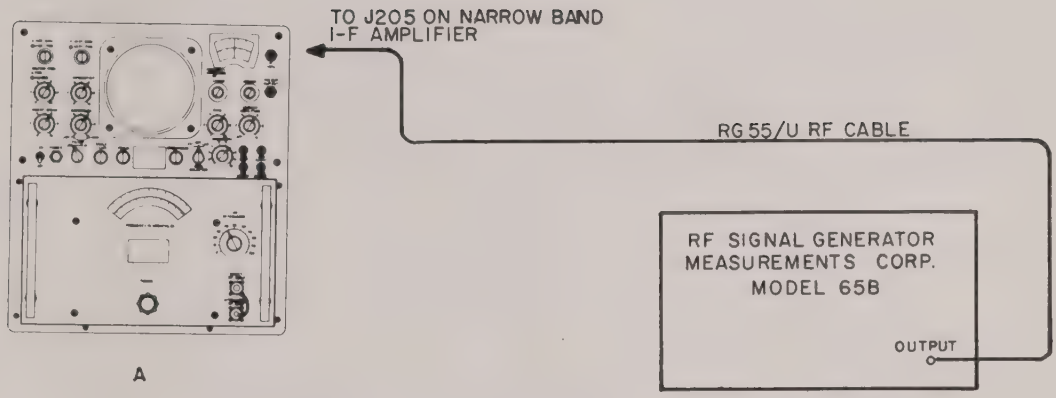


Figure 4-15. Typical Response Curve of Sweep Frequency Generator



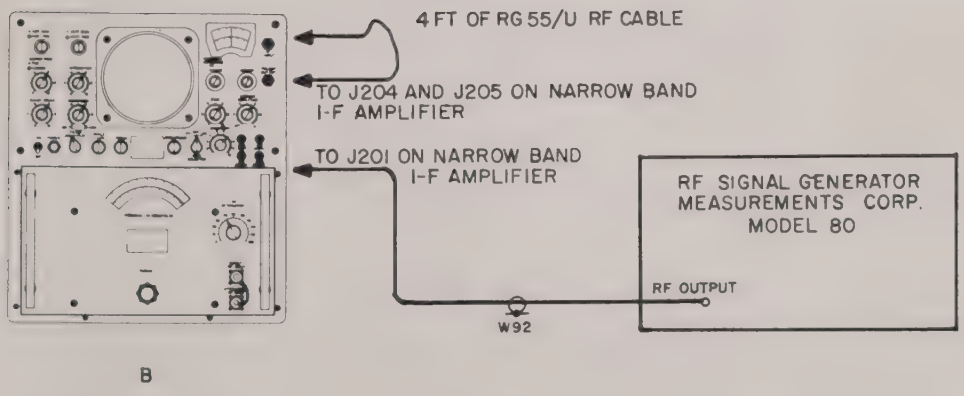


Figure 4-16. Test Setup for Checking and Aligning the Narrow Band I-f Amplifier

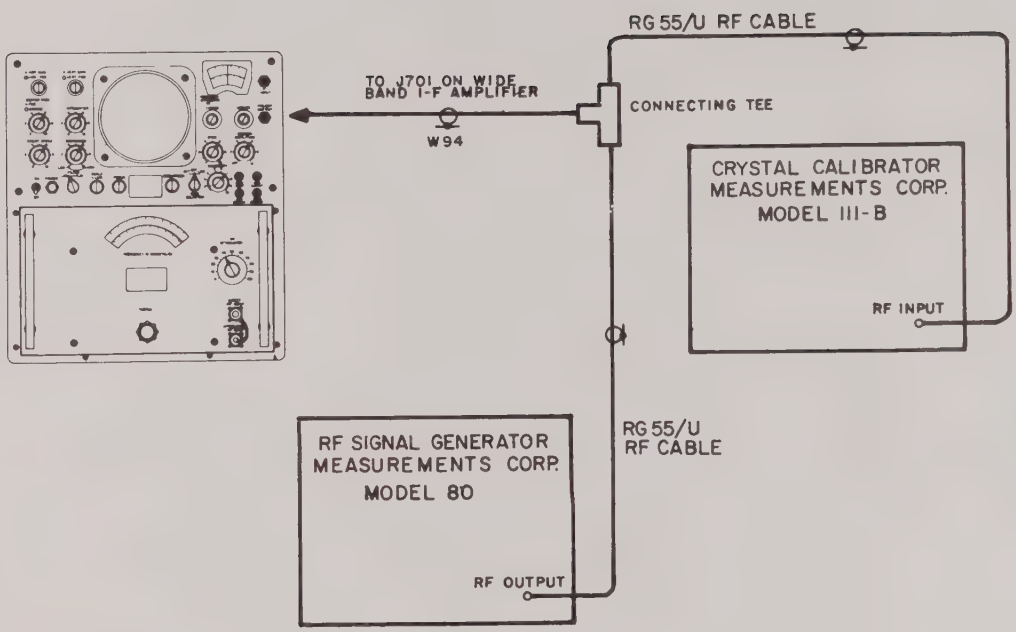


Figure 4-17. Test Setup for Checking and Aligning the Marker Oscillator

b. Set the DISPERSION control at Low.

c. Couple the Model 65B to J205 as shown in figure 4-16. Tune to exactly 500 kc with 30 percent 1000 cps modulation.

d. Adjust L209, L216, L219 (figure 4-5) for maximum display on the CRT.

e. Tune the Model 65B to exactly 6.0 mc with 30 percent 1000 cps modulation. Check frequency with counter.

f. Adjust L213, for maximum display on the CRT.

g. Connect the Model 80 to J201 as shown in B, figure 4-16. Tune to 64 mc with 30 percent 1000 cps modulation.

h. Adjust L225, L205, L202, T201 for maximum display on the CRT.

i. Check the sensitivity of the amplifier for 2 cm of deflection with 150 microvolts input.

j. Disconnect the test setup and reconnect the cables to J204, J205 and J201.

J203

4-33. MARKER OSCILLATOR. To check the performance of the marker oscillator circuit, observe the marker pip on the display of the spectrum analyzer, as follows:

a. Connect the Model 80 and the Model 111-B to J701 of the Wide Band I-F Amplifier, as shown in figure 4-17.

b. Tune the Model 80 to 200 mc, the Model 111-B for 10 mc markers.

c. Observe the screen of the CRT to locate the 120, 160, and 200 mc crystal markers.

d. Use a wax marking pencil to inscribe the location of the 120 and 200 mc markers on the CRT screen.

e. Set the Model 111-B to 1 and mark the location of the 122 and 118 mc markers.

f. Rotate the MARKER AMPLITUDE control to its approximate mid-position. Set the control to obtain convenient height of signal pip.

g. Vary the marker oscillator COARSE control for a reading of plus 40 mc on the FREQUENCY DIFFERENCE MCS dial with FINE control set to 0.

h. If the marker oscillator pip falls between the 118 and 122 mc markers, the marker oscillator circuit is operating satisfactorily at the low end of its frequency excursion.

i. Vary the marker oscillator COARSE control for a reading of minus 40 mc, on the FREQUENCY DIFFERENCE MCS dial.

j. If the marker oscillator pip falls between the 198 and 202 mc markers, the marker oscillator circuit is also operating satisfactorily at the high end of its frequency excursion.

k. In the event that the alignment error of the marker oscillator is greater than 2.0 mc, realignment will be required. Proceed as follows:

(1) Tune the COARSE FREQUENCY DIFFERENCE MCS dial to a reading of plus 40 mc.

(2) Adjust L303 (figure 4-5) until the marker oscillator pip coincides with the plus 40 mc marker.

(3) Tune the COARSE FREQUENCY DIFFERENCE MCS dial to a reading of minus 40 mc.

(4) Adjust C305 until the marker oscillator pip coincides with the minus 40 mc marker.

(5) Alternately adjust the plus and minus limits, steps (1) through (4) until the calibration is correct.

l. Set the COARSE control to 0, the DISPERSION switch to LOW, the Model 111-B to 1 mc.

m. Vary the marker oscillator VERNIER control from -1 to +1 mc comparing the dial and the crystal calibrator markers at -1, 0, and +1. If within 200 kc, no further adjustment is necessary.

n. If greater than 200 kc, adjust C303 until dial is within 200 kc.

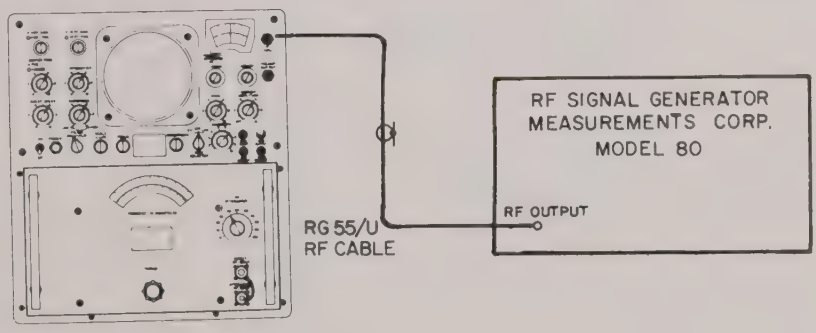
o. Recheck k.

p. Disconnect the test setup and reconnect the cable to J701.

4-34. VARIABLE-BANDWIDTH I-F CONTROL AMPLIFIER. To check and align the variable bandwidth i-f control amplifier proceed as follows:

a. Connect the Model 65B to J205 of the narrow band i-f amplifier.

b. Set the Model 65B to exactly 6 mc at 1000 cps 30 percent modulation. Check this frequency with the Model 524 Counter.



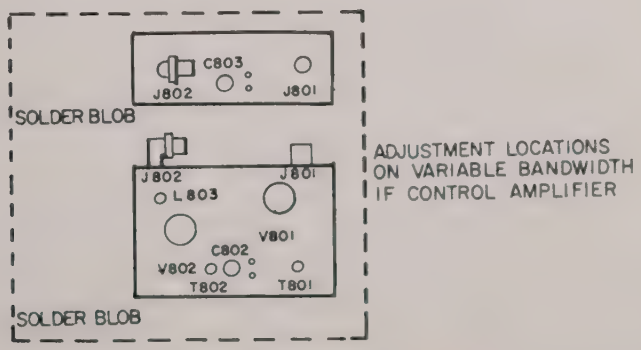


Figure 4-18. Test Setup for Checking and Aligning the Variable Bandwidth I-f Control Amplifier

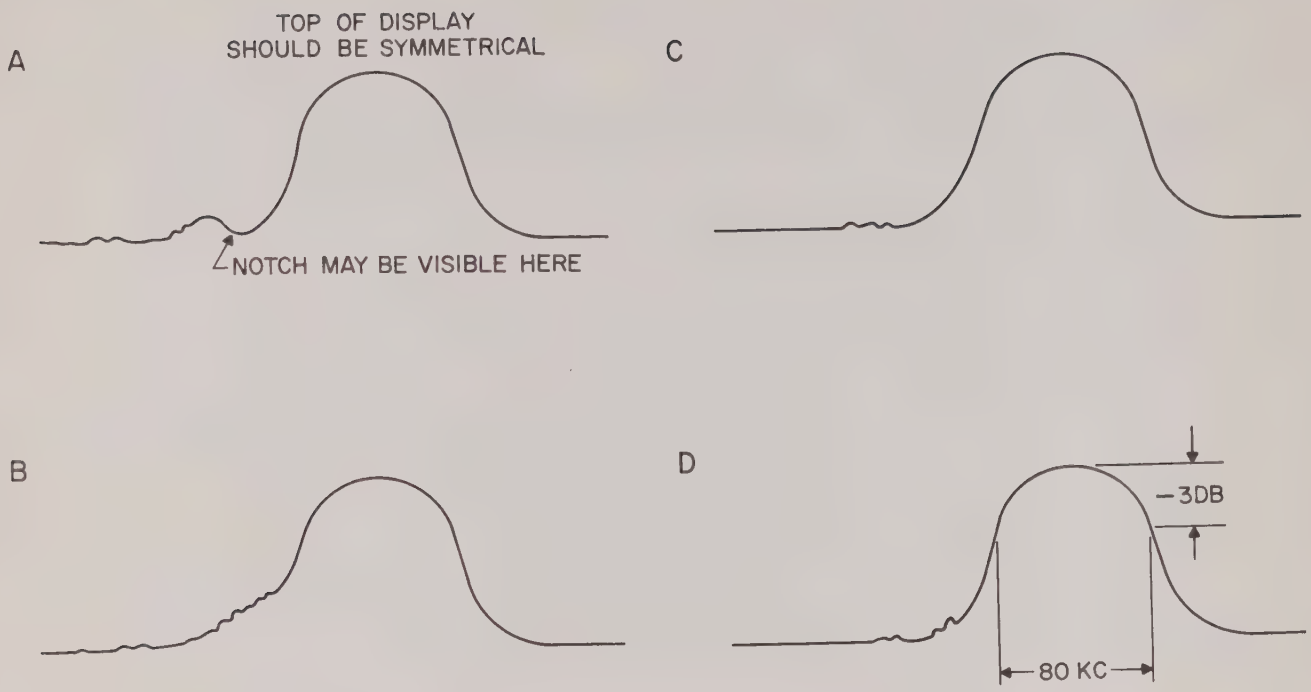


Figure 4-19. Resultant Displays for Variable Bandwidth I-f Amplifier Alignment

c. Adjust L213 for maximum deflection.

d. Disconnect the cable connecting the PREAMP OUTPUT and I-F INPUT connectors on the front panel.

e. Connect the Model 80 to the I-F INPUT connector as shown in figure 4-18.

f. Set the Model 80 to 160 mc.

g. Set C802 and C803 (figure 4-5) to half maximum, as shown by the solder blob locations in figure 4-18.

h. Set L803, T801 and T802 for minimum inductance.

i. Set the BANDWIDTH control to maximum CW position.

j. Set the DISPERSION control to maximum CW position.

k. Adjust the SWEEP SPEED control for a sweep rate of 10 cps.

l. Set the VERT GAIN control to 50 percent of maximum CW position.

m. Increase the input signal from Model 80 until it is visible on the CRT display.

n. Adjust L803 for maximum deflection on the CRT display.

o. Adjust the VERT GAIN control to obtain "one box" of signal.

p. Adjust DISPERSION control for 300 kc/s dispersion.

q. Adjust T801 and T802 alternately for minimum deflection on CRT display.

r. Adjust rf input signal, and, if necessary, VERT GAIN control to obtain "3 boxes" of signal.

s. Adjust C802 and C803 for minimum amplitude of the irregularities and notch as shown in B, figure 4-19.

t. Adjust L803 for maximum output with symmetrical response as shown in C, figure 4-19.

u. Set BANDWIDTH control to maximum CCW.

v. Adjust L213 in the narrow band i-f amplifier for maximum deflection on the CRT.

w. Reset C802, C803, T801, and T802, if necessary, to obtain the display shown in D, figure 4-19 with BANDWIDTH control to maximum CW. Disconnect the test setup and reconnect the cable on the front panel from PREAMP OUTPUT connector to I-F INPUT connector.

4-35. VIDEO AMPLIFIER. To check the video chassis, perform the following measurements and, if needed, the following adjustments: (See figure 4-7).

a. Measure with a VTVM from terminal 2 of R508 to ground. If zero volts DC is not indicated, adjust R508. (HORIZONTAL OUTPUT)

b. Connect the audio oscillator to J502 and place the LOG-FILTER-LIN switch in LIN position. Set the oscillator frequency for 1000 cps and the output for 4.5 volts peak-to-peak. Adjust R512 to obtain a peak-to-peak deflection of 10 cm on the CRT.

c. Turn the VERT GAIN control fully counter-clockwise and place the LOG-FILTER-LIN switch to LIN. Observe the base line on the CRT.

d. Place the LOG-FILTER-LIN switch to LOG. The base line should remain in the same position observed in step c.

e. If this indication is not obtained, adjust R555 to return the base line to the same position observed in step c.

f. Set the controls of the spectrum analyzer for and 80 mc dispersion and observe the CRT for retrace and signal foldover. If needed, adjust R515 (figure 4-7) so that no retrace of signal foldover appears on the screen. Do not overblank.

g. With the DISPERSION HIGH-LOW switch in HIGH position and the DISPERSION control maximum clockwise, check the dispersion with the marker oscillator. If it is not 80 mc, adjust R536 for 80 mc dispersion.

h. With the DISPERSION HIGH-LOW switch in LOW position and the DISPERSION control maximum clockwise, check the dispersion with the marker oscillator. If it is not 10 mc, adjust R537 for 10 mc dispersion.

i. With the spectrum analyzer set for an 80 mc dispersion, and the FREQUENCY DIFFERENCE MCS dials set at zero, check to determine if the full range of the CENTER FREQUENCY control moves the marker to each side of the screen. If this indication is not obtained, adjust R585 and R587.

j. Inject a 500 kc signal from the Model 65B Signal Generator into J502 and adjust C512 for minimum deflection on the screen of the cathode-ray tube.

4-36. Log Output Zero Adjustment.

4-37. Connect the VTVM to the LOG OUTPUT jack on the front panel and measure the DC voltage. If it is not zero VDC, adjust R549 for zero VDC.

4-38. Video Zero Adjustment.

4-39. Connect the VTVM to the VIDEO OUTPUT jack on the front panel and measure the DC voltage. If it is not zero VDC, adjust R511 for zero VDC.

4-40. LUBRICATION.

4-41. The Model TSA-W requires no lubrication other than that applied at the time of manufacture.

SECTION V

DIAGRAMS

5-1. SCOPE.

5-2. This section contains diagrams and tables which are essential aids to the maintenance of the Model TSA-W. Included in this section are the cabling and schematic diagrams, and voltage and resistance tables.

5-3. The schematic diagrams, figures 5-1 through 5-5, show the entire circuitry comprising the Model DU-2A Basic Unit. Figures 5-6 through 5-10 show the circuitry comprising Tuning Units Models STU-1WA, STU-2WA, STU-3WA, STU-4WA and STU-5WA, respectively. The diagrams should be used in conjunction with Section III to help the technician understand the operation of the equipment. The diagrams should be used in conjunction with Section IV to facilitate signal tracing and continuity testing during maintenance operations.

5-4. Voltage and resistance tables 5-1 through 5-13 should be used in conjunction with troubleshooting table 4-4 to aid in locating defective components in malfunctioning or inoperative circuits.

NOTE ALL VALUES ARE EXPRESSED IN MICRO-MICROFARADS (UUF), MICROHENRIES (UH) AND OHMS, UNLESS SUFFIXED BY: UF FOR MICROFARAD; MH FOR MILLIHENRY, H FOR HENRY, K FOR KILOHM, OR MEG FOR MEGOHM

CAPACITORS ARE RATED AT ±10%, 400 VDCW, UNLESS OTHERWISE INDICATED

INDUCTORS ARE RATED AT ±20%, 1000 VDC TEST, UNLESS OTHERWISE INDICATED

RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED

▭ INDICATES EQUIPMENT PANEL MARKING

⊘ INDICATES SCREWDRIVER ADJUSTMENT

RUN 5 AND UP

* WOUND ON A COMMON CORE

HM46707

TO 160 MC OUTPUT OF RF TUNING UNIT — W90 — P701 J701

I-F AMPLIFIER V701 6922

I-F AMPLIFIER V702 6922

I-F AMPLIFIER V703 6922

I-F AMPLIFIER V704 6922

WIDE-BAND I-F AMPLIFIER

P703 J703

J702 P702 — W89 — J85 P85 — PREAMP OUTPUT

J704 (MOUNTED ON FRAME HARNESS) P704

+125V

CRYSTAL CURRENT

6.3VAC

FILAMENT RET

GROUND

MARKER OSCILLATOR V301 5718

MARKER OSCILLATOR

P302 J302

MARKER AMPLITUDE

VERNIER

COARSE

J301 (MOUNTED ON FRAME HARNESS) P301

PART OF P125 (MATES WITH J125 ON SUPPLY CHASSIS)

UG-625A/U P801 J801

I-F AMPLIFIER 801A 1/2 12AT7

BANDWIDTH

I-F AMPLIFIER 801B 1/2 12AT7

I-F AMPLIFIER V802 6AG5

VARIABLE BANDWIDTH I-F CONTROL AMPLIFIER

P802 J802

J803 (MOUNTED ON FRAME HARNESS) P803

+125V

6.3VAC

FILAMENT RET

GROUND

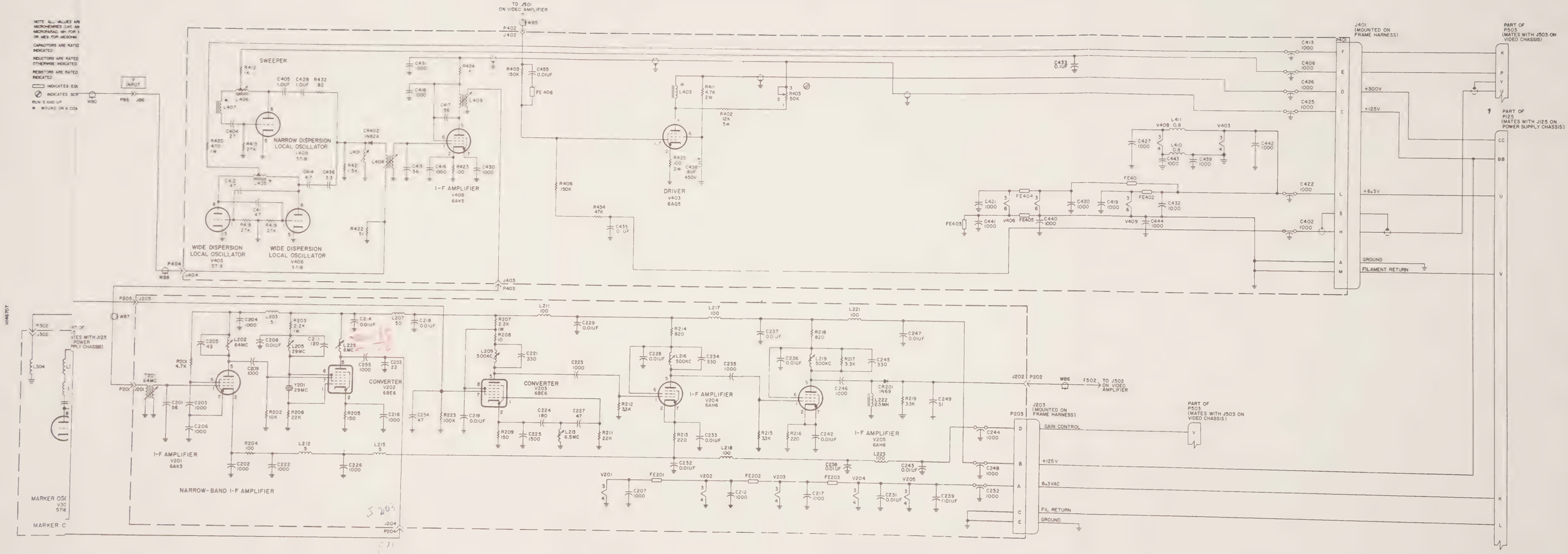
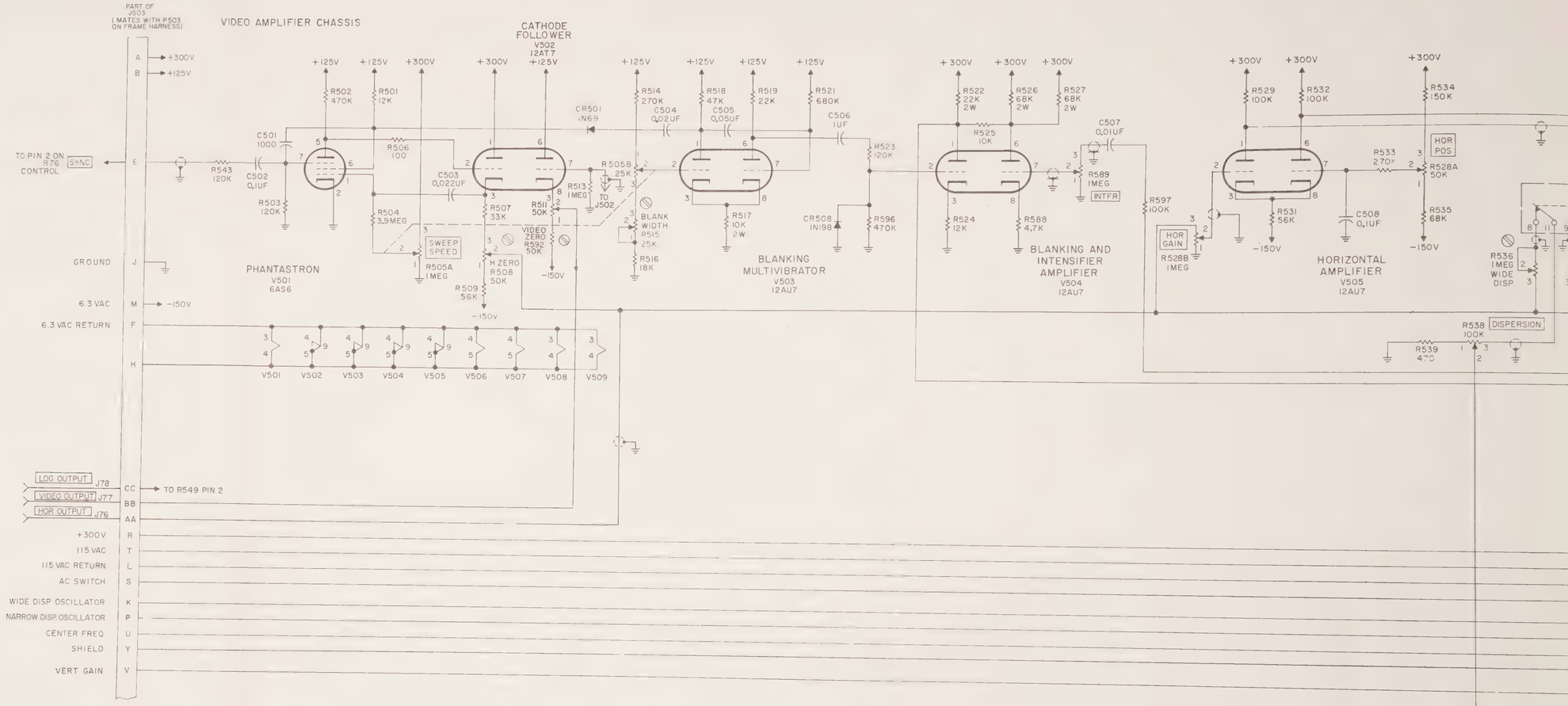


Figure 5-1. Model TSA-W Display Unit, Schematic Diagram



NOTE: ALL VALUES ARE EXPRESSED IN MICRO-MICROFARADS (UUF), MICROHENRIES (UH) AND OHMS, UNLESS SUFFIXED BY UF FOR MICROFARAD, MH FOR MILLIHENRY, H FOR HENRY, K FOR KILOHM, OR MEG FOR MEGOHM

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INDUCTORS ARE RATED AT ±20%, 1000 VDC TEST, UNLESS OTHERWISE INDICATED.

RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED

▭ INDICATES EQUIPMENT PANEL MARKING

⊘ INDICATES SCREWDRIVER ADJUSTMENT

RUN 5 AND UP

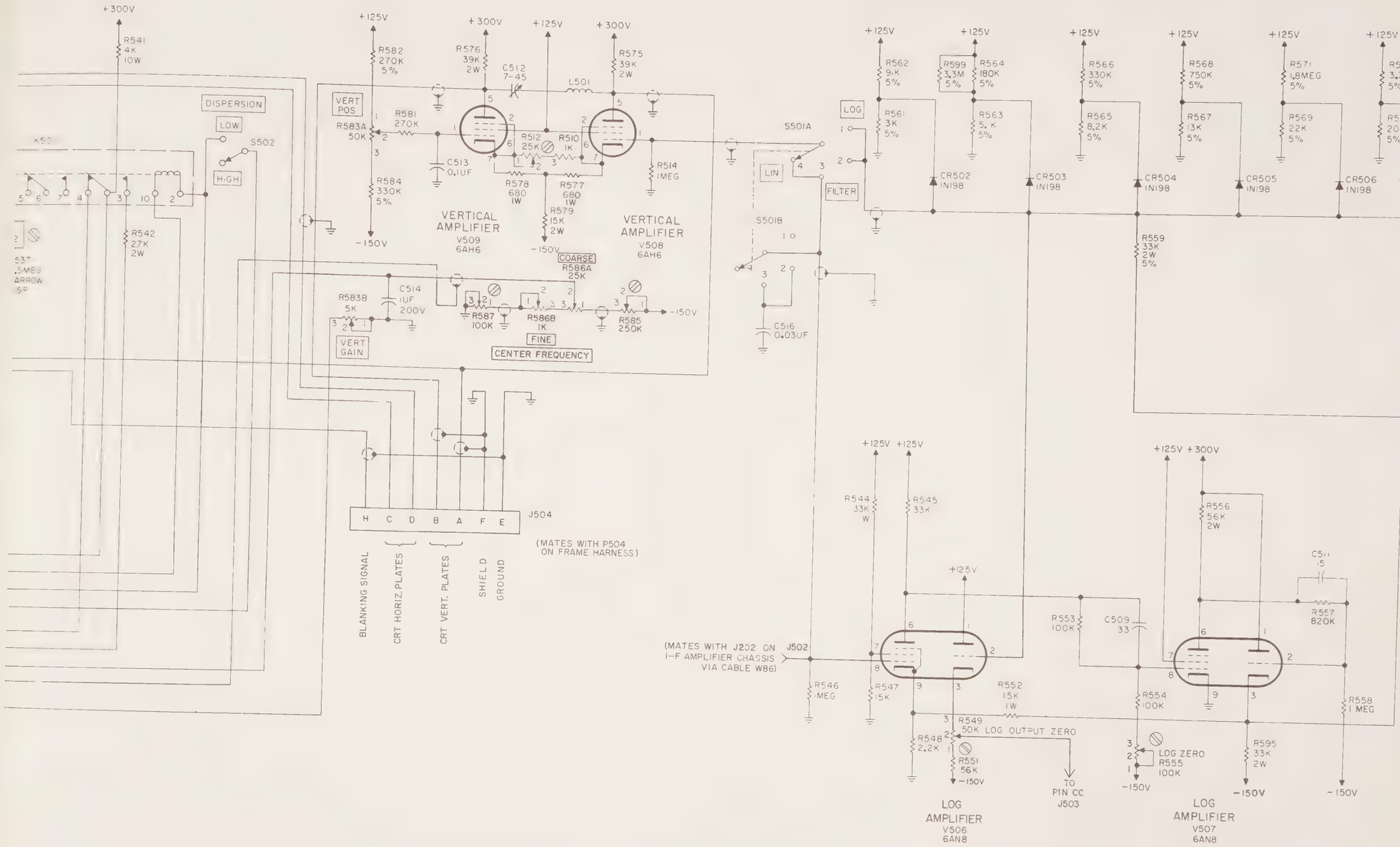
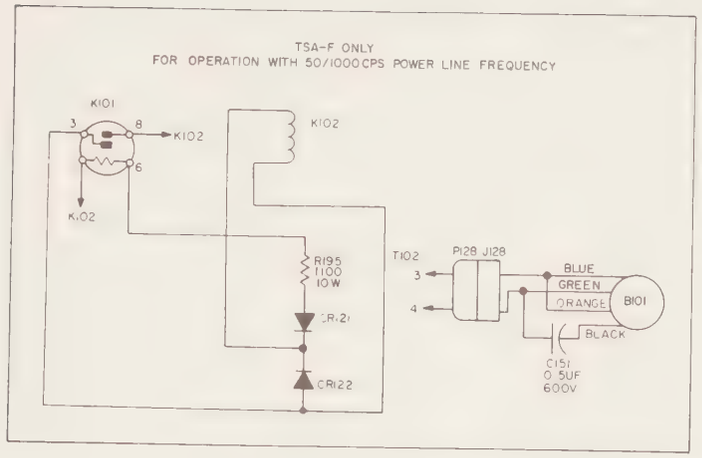
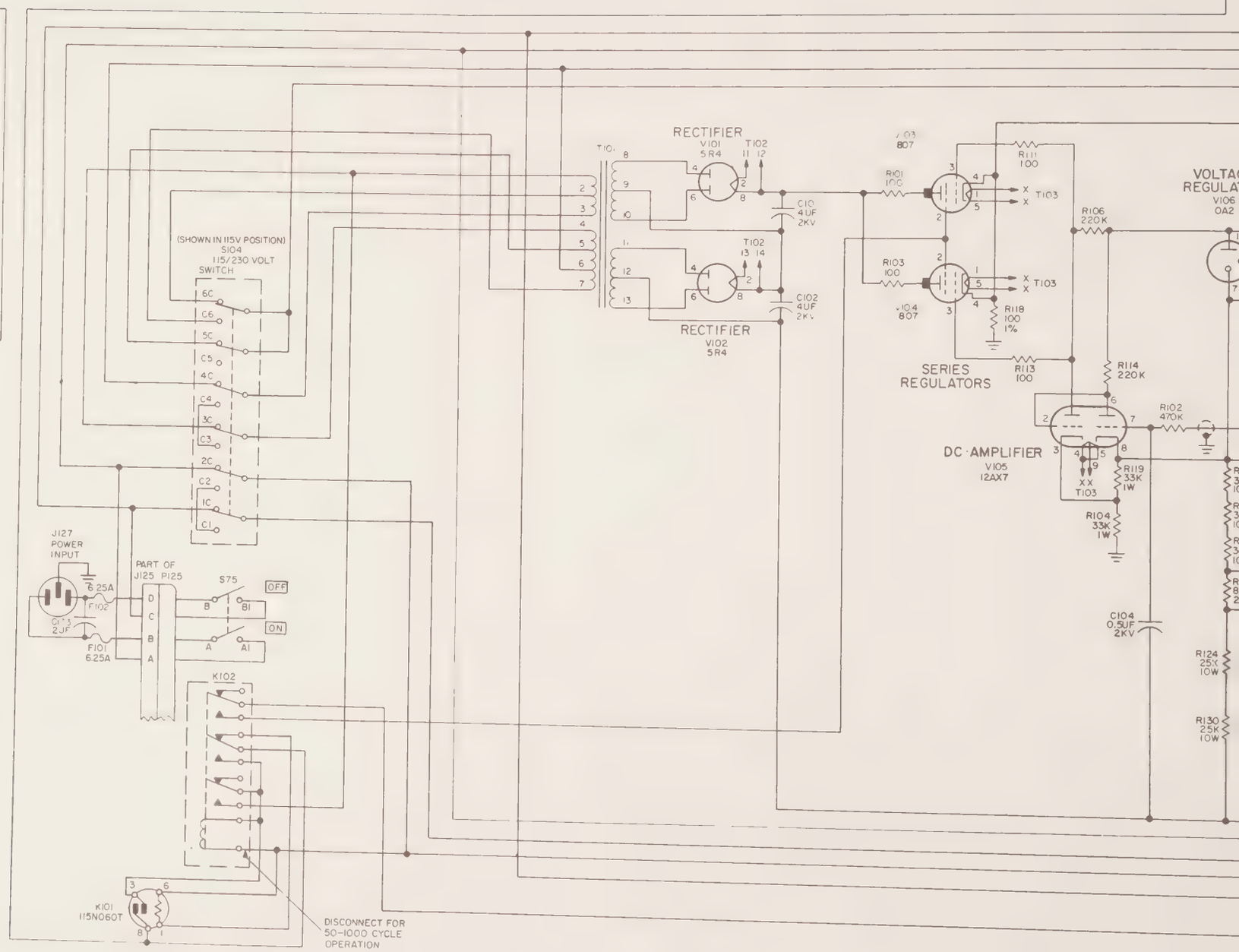


Figure 5-2. Model TSA-W Video Chassis, Schematic Diagram





D129135H

NOTE ALL VALUES ARE EXPRESSED IN MICRO-MICROFARADS (UUF), MICROHENRIES (UH) AND OHMS, UNLESS SUFFIXED BY UF FOR MICROFARAD, MH FOR MILLIHENRY, H FOR HENRY, K FOR KILOHM, OR MEG FOR MEGOHM

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INDUCTORS ARE RATED AT ±20%, 1000 VDC TEST, UNLESS OTHERWISE INDICATED

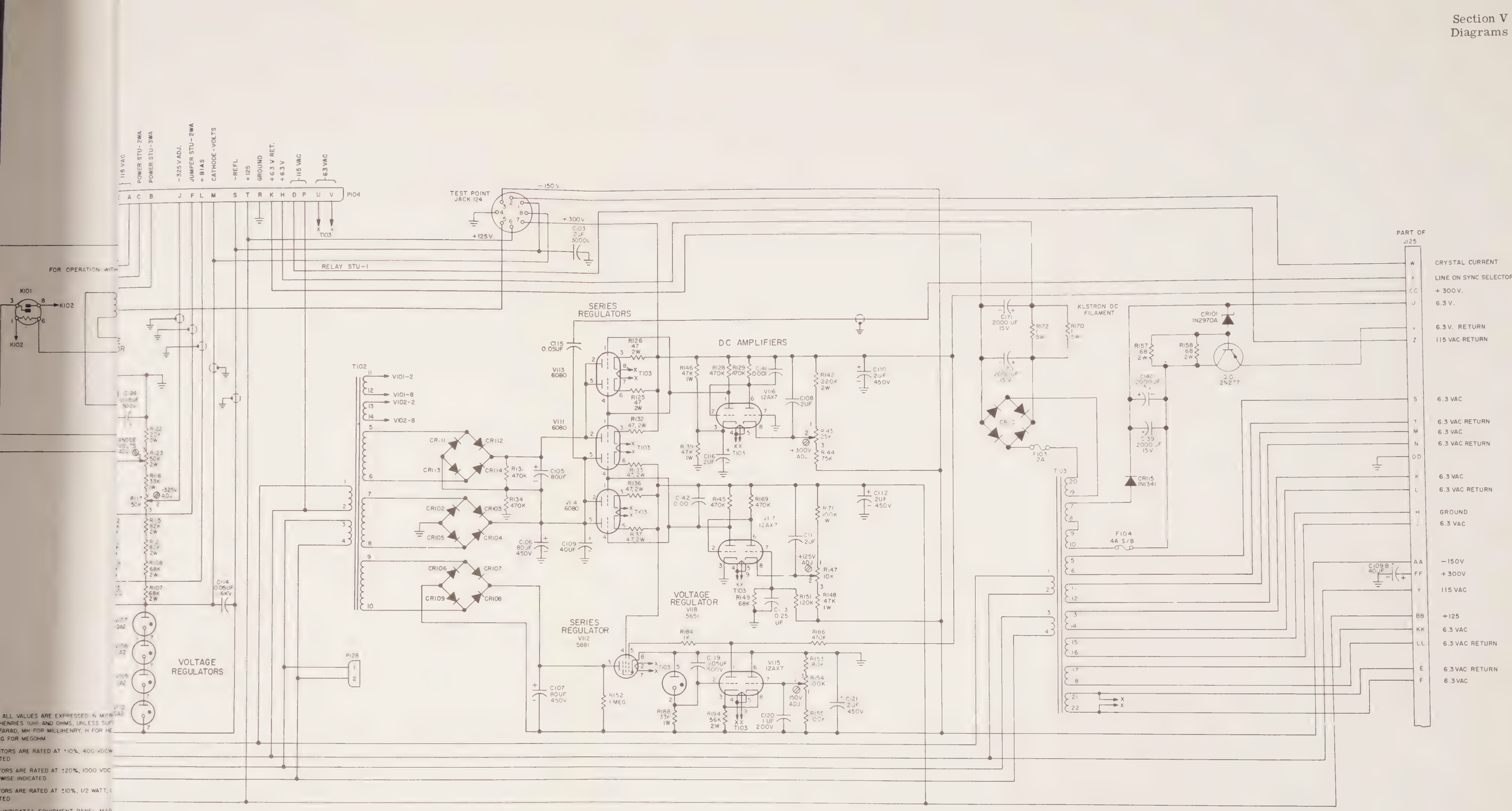
RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED

▭ INDICATES EQUIPMENT PANEL MARKING

⊘ INDICATES SCREWDRIVER ADJUSTMENT

TSA RUN 3 AND UP

TSA-W RUN 5 AND UP



ALL VALUES ARE EXPRESSED IN MICR
HENRIES (UH) AND OHMS, UNLESS SUFI
FARAD, MH FOR MILLIHENRY, H FOR HE
G FOR MEGOHM
TORS ARE RATED AT ±10%, 400 VDCW
TED
TORS ARE RATED AT ±20%, 1000 VDC
WISE INDICATED
TORS ARE RATED AT ±10%, 1/2 WATT,
TED
INDICATES EQUIPMENT PANEL MAR
INDICATES SCREWDRIVER ADJUSTM
UN 3 AND UP
RUN 5 AND UP

Figure 5-3. Klystron and Low Voltage Power Supply, Schematic Diagram

NOTE: ALL VALUES ARE EXPRESSED IN MICRO-MICROFARADS (UUF), MICROHENRIES (UH) AND OHMS, UNLESS SUFFIXED BY UF FOR MICROFARAD, MH FOR MILLIHENRY, H FOR HENRY, K FOR KILOHM, OR MEG FOR MEGOHM.

CAPACITORS ARE RATED AT ±10%, 400 VDCW, UNLESS OTHERWISE INDICATED.

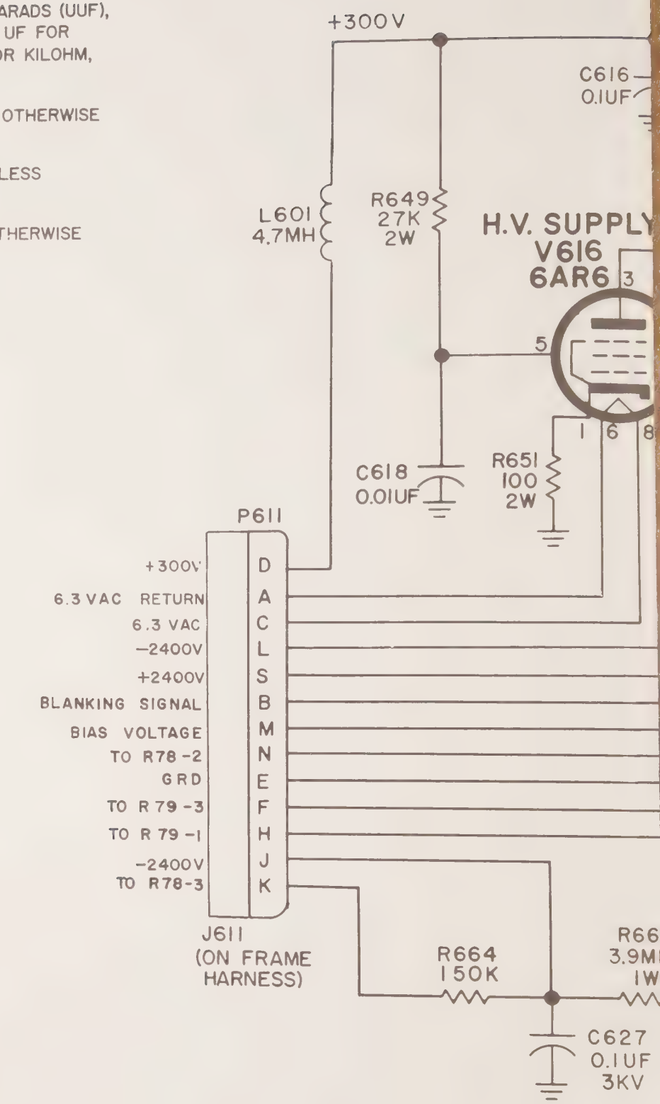
INDUCTORS ARE RATED AT ±20%, 1000 VDC TEST, UNLESS OTHERWISE INDICATED.

RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED.

▭ INDICATES EQUIPMENT PANEL MARKING.

⊘ INDICATES SCREWDRIVER ADJUSTMENT.

8130 RUN 6 AND UP
8120 RUN 5 AND UP
8100 RUN 3 AND UP



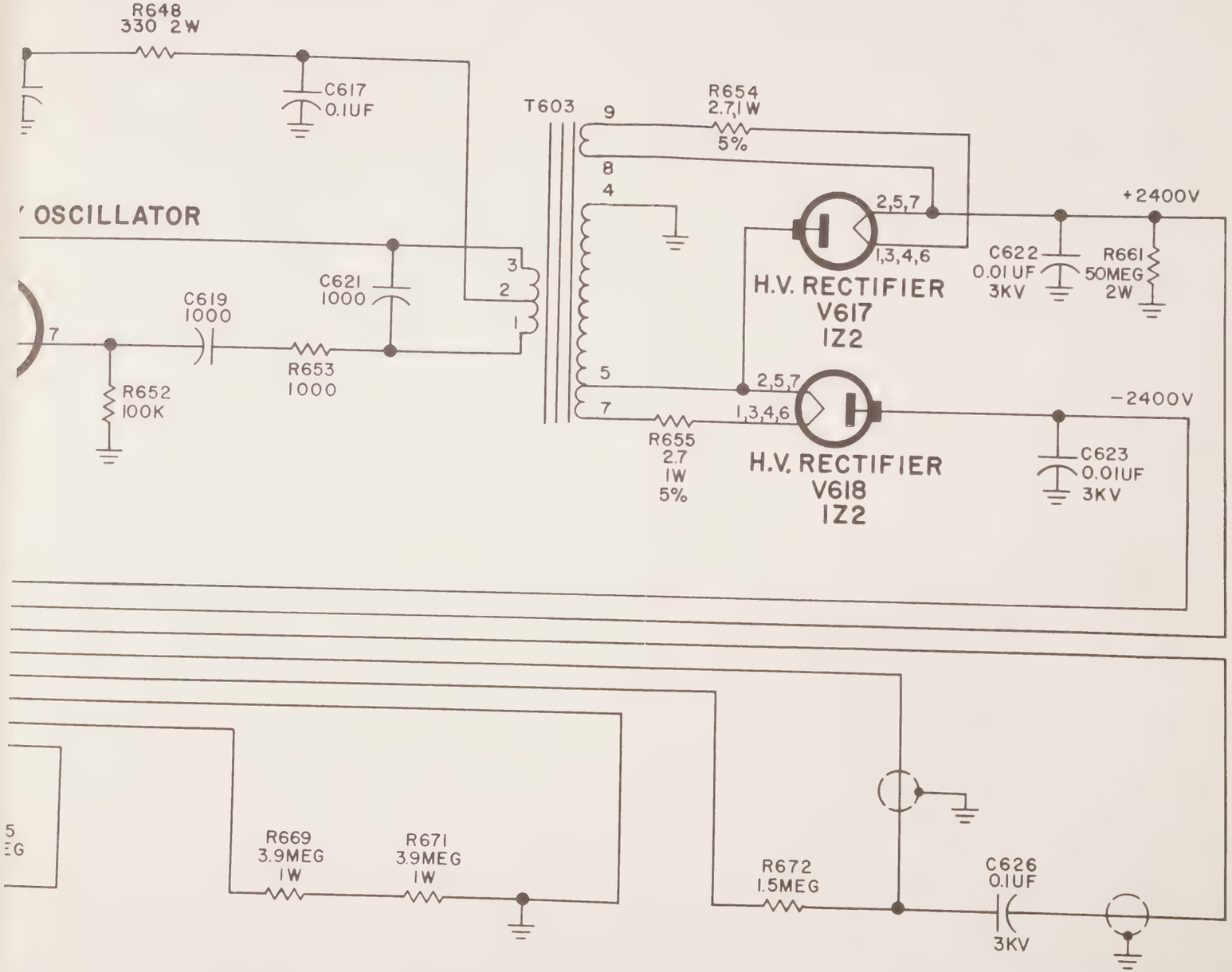


Figure 5-4. CRT Power Supply, Schematic Diagram

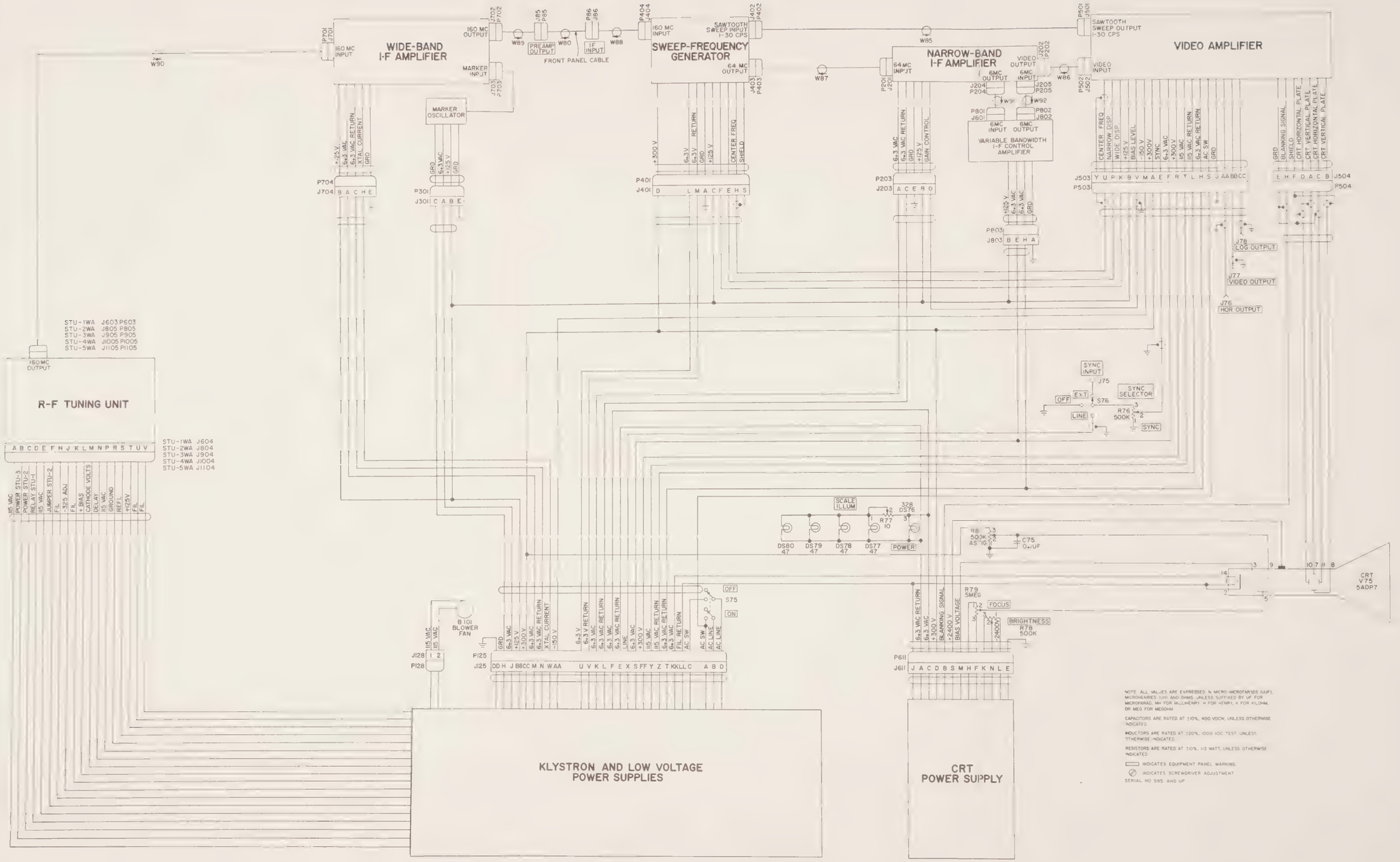


Figure 5-5. Interchassis Cabling Diagram

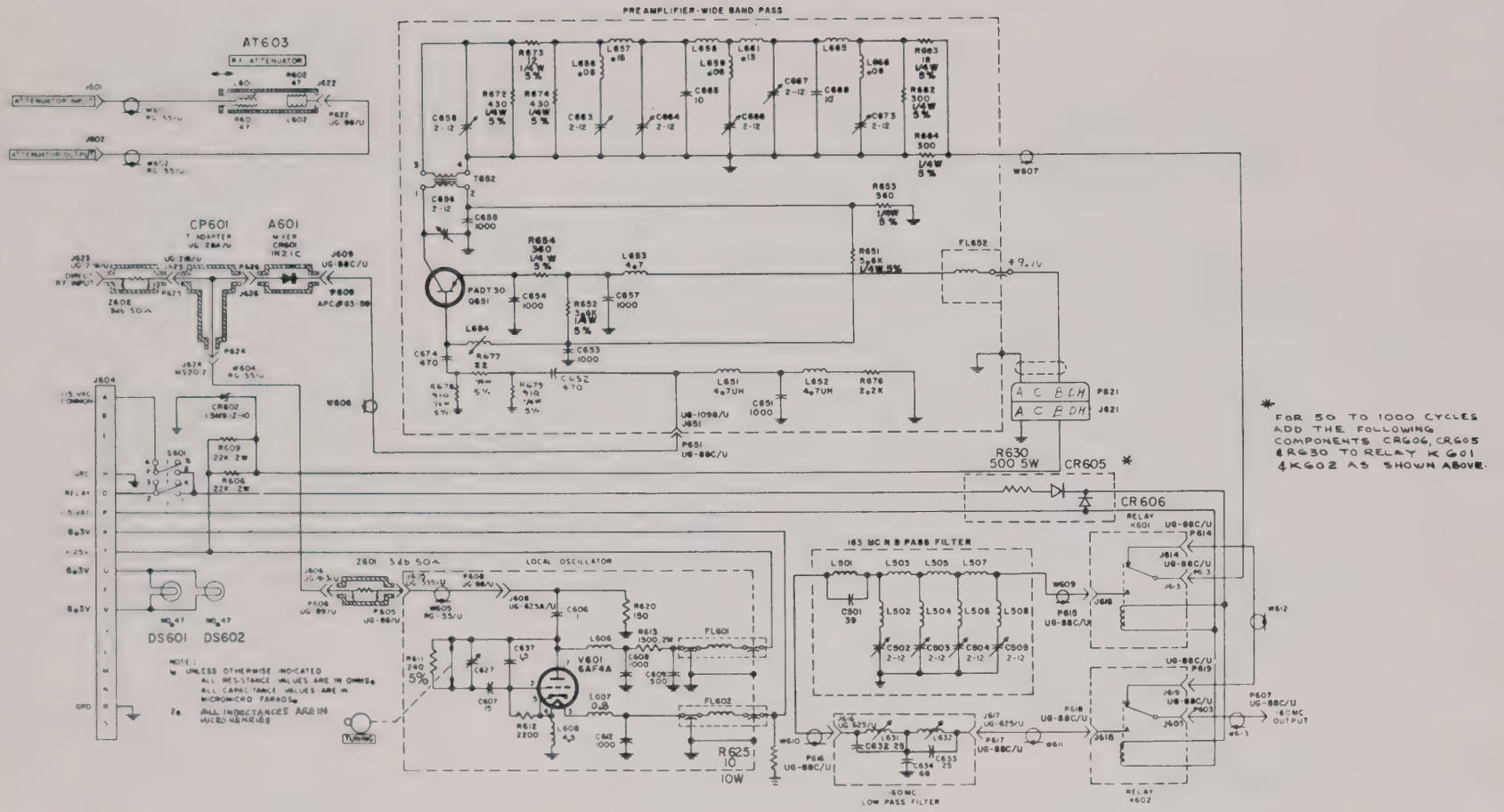


Figure 5-6. Tuning Unit STU-1WA, Schematic Diagram

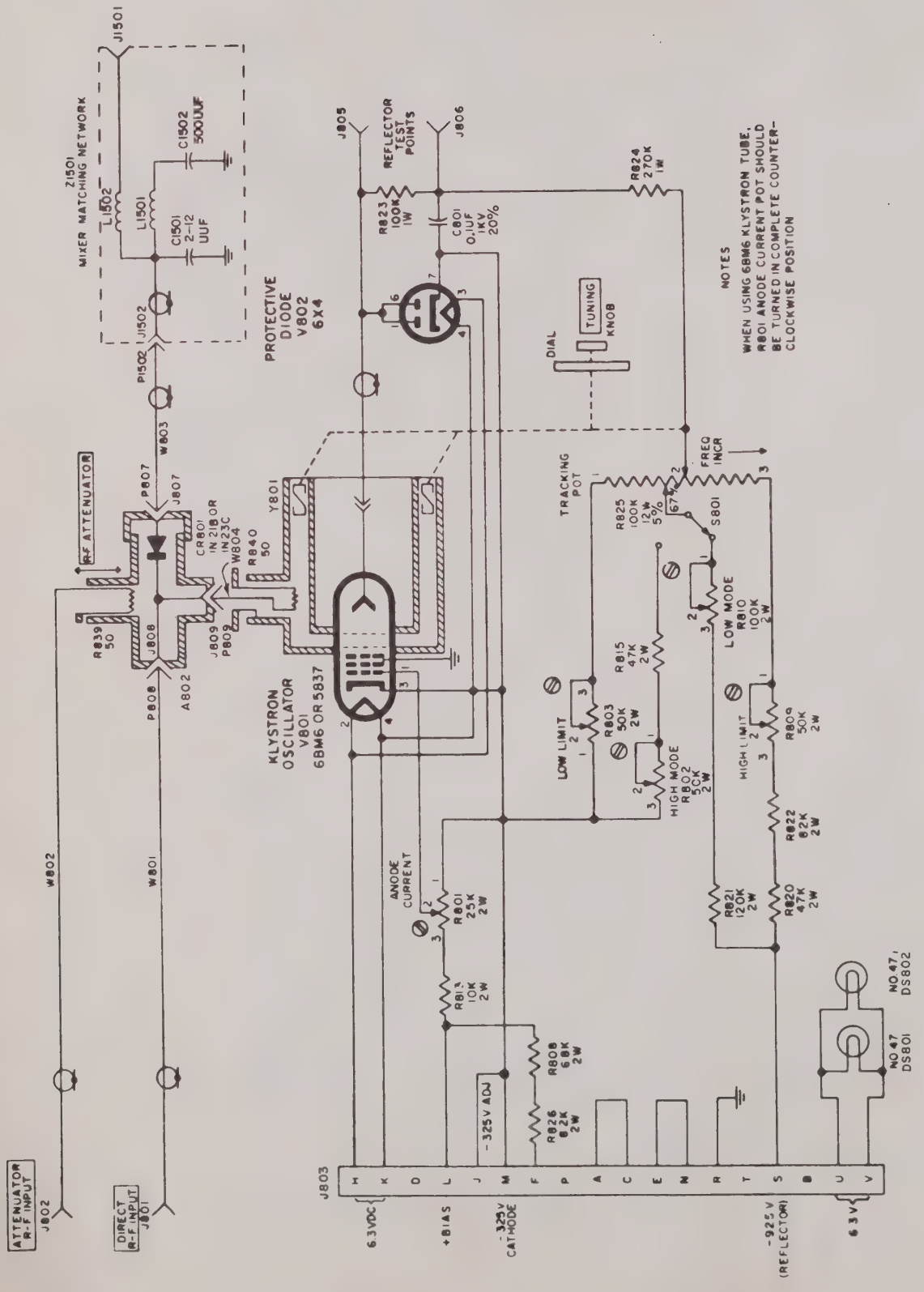


Figure 5-7. Tuning Unit Model STU-2WA, Schematic Diagram

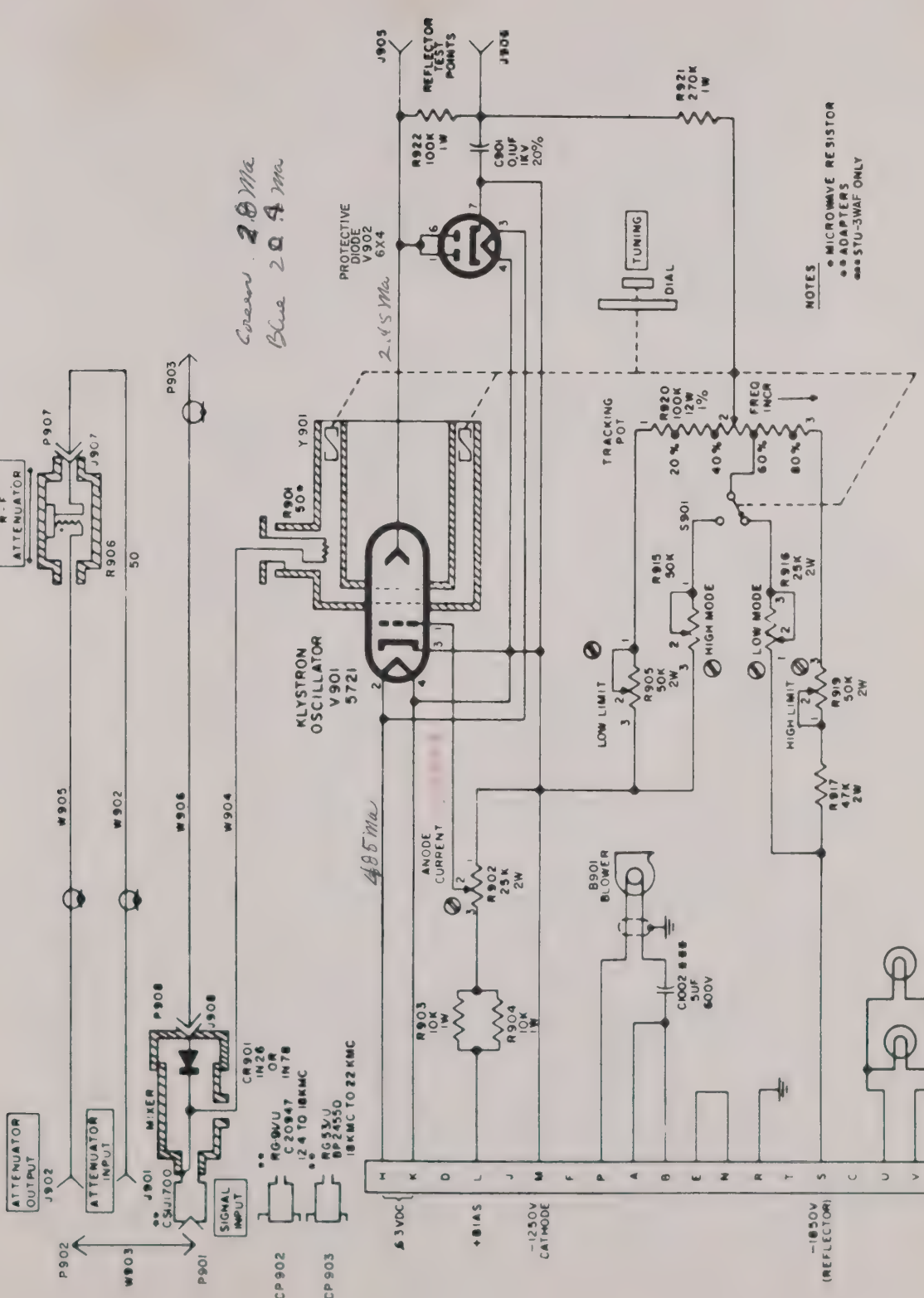


Figure 5-8. Tuning Unit Model STU-3WA, Schematic Diagram

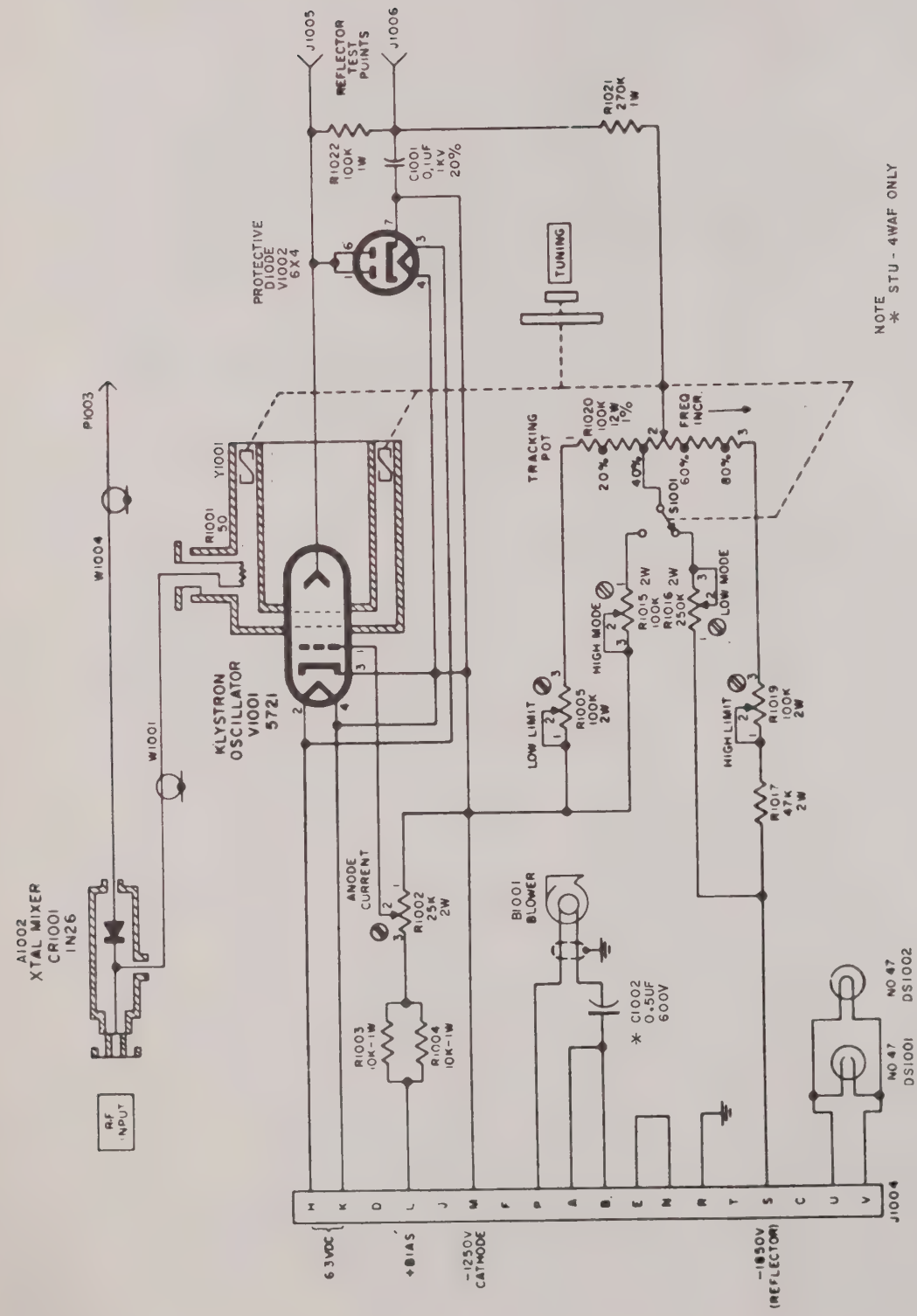


Figure 5-9. Tuning Unit Model STU-4WA, Schematic Diagram

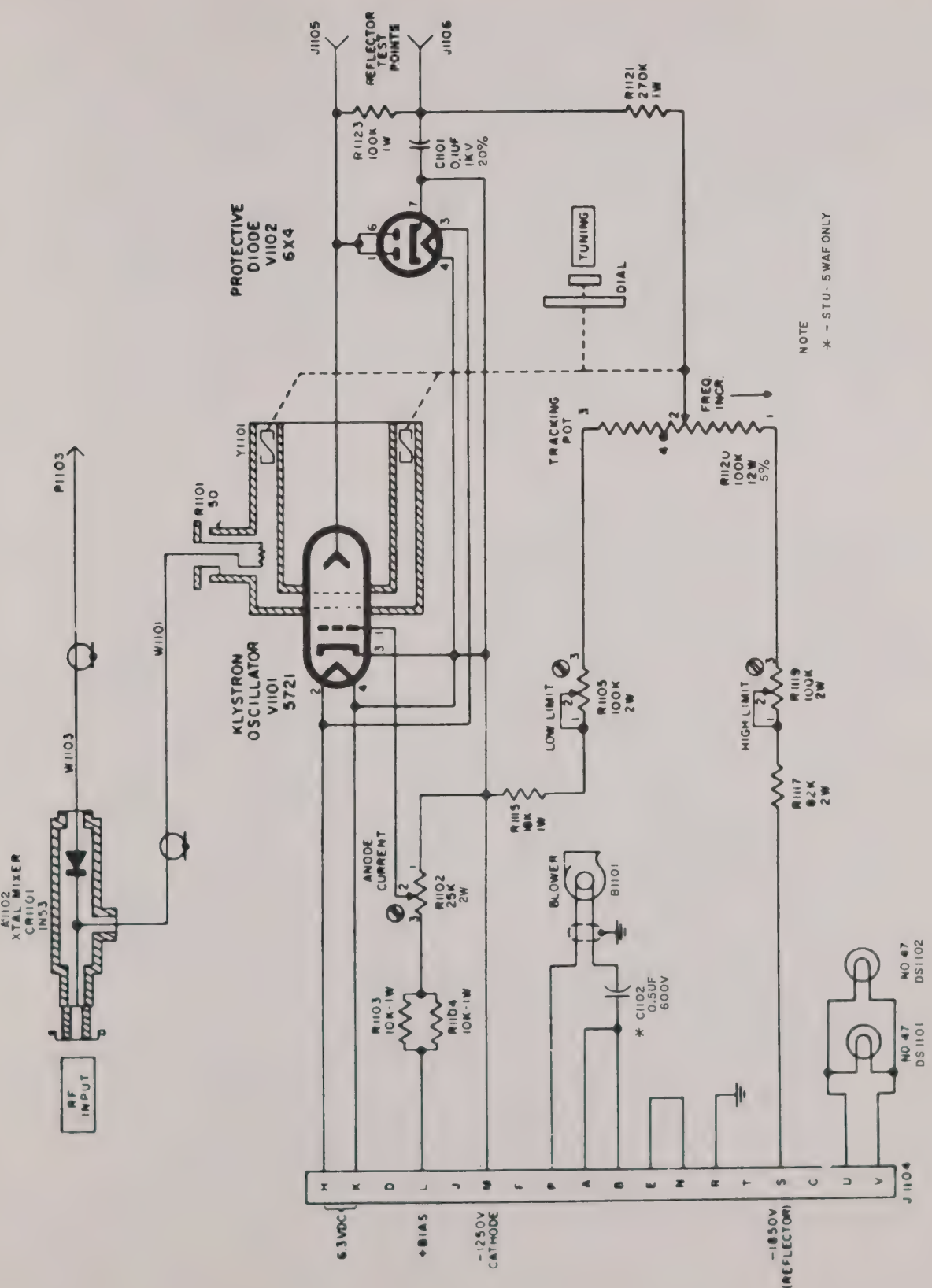


Figure 5-10. Tuning Unit Model STU-5WA, Schematic Diagram

TABLE 5-1. WIDE-BAND I-F AMPLIFIER VOLTAGE AND RESISTANCE MEASUREMENTS

Socket	Tube Type	Pin Numbers 1	2	3	4	5	6	7	8	9	
XV701	6922	95 17K	0 0	1.8 68	Fil 0	0 0	95 17K	0 0	1.8 68	0 0	Volts Ohms
XV702	6922	115 15K	0 0	2.0 100	0 0	Fil 0	115 75K	0 0	2.0 100	0 0	Volts Ohms
XV703	6922	115 15K	0 0	2.0 100	0 0	Fil 0	115 15K	0 0	2.0 100	0 0	Volts Ohms
XV704	6922	95 16K	0 0	1.8 100	0 0	Fil 0	95 15K	0 0	1.8 100	0 0	Volts Ohms

TABLE 5-2. SWEEP FREQUENCY GENERATOR VOLTAGE AND RESISTANCE MEASUREMENTS

Socket	Tube Type	Pin Numbers 1	2	3	4	5	6	7	8	9	
XV403	6AQ5/ 6005	-19 100K	2.5 100	Fil 0	0 0	250 24K	270 28K	-19 100K			Volts Ohms
XV405 Note 4	5718	-1.1 27K		Fil 0		0 0	0 0		150 33K		Volts Ohms
XV406 Note 4	5718	-1.1 27K		Fil 0		0 0	0 0		150 33K		Volts Ohms
XV408	6AK5	0 0	1.4 100	Fil 0	0 0	104 16K	104 16K	1.4 100			Volts Ohms
XV409 Note 5	5718	-3 27K		0 0		0 0	Fil 0		150 35K		Volts Ohms

Note:
1. FIL. = 6.3 V AC between pins so marked.
2. Voltage readings taken with a 20,000 ohm-per-volt VOM between pin and ground.
3. Resistance readings taken with power cable removed.
4. Dispersion switch HIGH.
5. Dispersion switch LOW.

TABLE 5-3. NARROW-BAND I-F AMPLIFIER VOLTAGE AND RESISTANCE MEASUREMENTS

Socket	Tube Type	Pin Numbers									
		1	2	3	4	5	6	7	8	9	
XV201	6AK5	0 0	3.5 1.5K	Fil 0	0 0	125 15K	120 20K	3.5 1.5K			Volts Ohms
XV202	6BE6	2.6 22K	1.3 150	Fil 0	0 0	125 15K	106 17K	0 100K			Volts Ohms
XV203	6BE6	-1.8 22K	1.6 150	Fil 0	0 0	98 18K	98 18K	0 10K			Volts Ohms
XV204	6AH6	0 3.3K	3.5 1.5K	Fil 0	0 0	120 16K	120 16K	3.5 1.5K			Volts Ohms
XV205	6AH6	0 3.3K	1.5 220	Fil 0	0 0	115 16K	115 16K	1.5 220			Volts Ohms

TABLE 5-4. VIDEO AMPLIFIER VOLTAGE AND RESISTANCE MEASUREMENTS

Socket	Tube Type	Pin Numbers									
		1	2	3	4	5	6	7	8	9	
XV501	6AS6	-6.5 5M	0 0	Fil 0	0 0	42 500K	120 30K	-1.0 120K			Volts Ohms
XV502	12AT7	300 23K	42 500K	65 120K	0 0	0 0				Fil 0	Volts Ohms
XV503	12AU7	115 65K	9 22K	28 10K	0 0	0 0	65 37K	25 700K	28 10K	Fil 0	Volts Ohms
XV504	12AU7	240 45K	5 400K	21 12K	0 0	0 0	235 40K	0 10K	11 4.7K	Fil 0	Volts Ohms
XV505	12AU7	165 115K	0 320K	8 75K	0 0	0 0	185 115K	-1.6 350K	8 75K	Fil 0	Volts Ohms
XV506	6AN8				Fil 0	0 0	75 48K	37 12K	0 30K	0.7 2K	Volts Ohms
XV507	6AN8	300 23K	-21 500K	-4 10K	Fil 0	0 0	87 76K	125 15K	-3 85K	0 0	Volts Ohms
XV508	6AH6	0 30K	2.9 33K	Fil 0	0 0	193 63K	125 15K	2.9 33K			Volts Ohms
XV509	6AH6	0.2 370K	2.9 33K	Fil 0	0 0	115 63K	125 15K	2.9 33K			Volts Ohms

Note: 1. FIL. = 6.3 V AC between pins so marked.
2. Voltage readings taken with a 20,000 ohm-per-volt VOM between pin and ground.
3. Resistance readings taken with power cable removed.

TABLE 5-5. VARIABLE BANDWIDTH I-F CONTROL AMPLIFIER VOLTAGE AND RESISTANCE MEASUREMENTS

Socket	Tube Type	Pin Numbers 1	2	3	4	5	6	7	8	9	
XV801	12AT7	125 15K	0 100K	.6 100	Fil 0	Fil 0	125 15K	0 3.5	.6 100	0 0	Volts Ohms
XV802	6AG5	0 3.5	1.8 270	0 0	Fil 0	125 15K	125 15K	1.8 270			Volts Ohms

TABLE 5-6. MARKER OSCILLATOR CHASSIS VOLTAGE AND RESISTANCE MEASUREMENTS

Socket	Tube Type	Pin Numbers 1	2	3	4	5	6	7	8	9	
XV301	5718	-1.5 10K		Fil 0		0 0	0 0		90 18K		Volts Ohms

TABLE 5-7. POWER SUPPLY CHASSIS VOLTAGE AND RESISTANCE MEASUREMENTS

Socket	Tube Type	Pin Numbers 1	2	3	4	5	6	7	8	9	
XV101 Note 4	5R4		680 ∞		-580 ∞		-580 ∞		680 ∞		Volts Ohms
XV102 Note 4	5R4		-580 ∞		-1850 175K		-1850 175K		-580 ∞		Volts Ohms
XV103 Note 4	807	Fil 0	125 ∞	-7.4 220K	3.2 100	Fil 0					Volts Ohms
XV104 Note 4	807	Fil 0	125 ∞	-7.4 220K	3.2 100	Fil 0					Volts Ohms
XV105 Note 4	12AX7	-7.4 220K	-74 220K	-73 33K	Fil 0	Fil 0	-74 220K	-152 500K	-150 66K	Fil 0	Volts Ohms
XV106 Note 4	0A2	0 0						-150 66K			Volts Ohms
XV107 Note 4	0A2	-1250 125K						-1400 ∞			Volts Ohms
XV108 Note 4	0A2	-1400 ∞						-1550 ∞			Volts Ohms

Note: 1. FIL. = 6.3 V AC between pins so marked.
2. Voltage readings taken with a 20,000 ohm-per-volt VOM between pin and ground.
3. Resistance readings taken with power cable removed.
4. STU-3WA, 4WA, 5WA operation.

(Cont'd)

TABLE 5-7. POWER SUPPLY CHASSIS VOLTAGE AND RESISTANCE MEASUREMENTS (Cont'd)

Socket	Tube Type	Pin Numbers 1	2	3	4	5	6	7	8	9	
XV109 Note 4	0A2	-1550 0						-1700 ∞			Volts Ohms
XV110 Note 4	0A2	-1700 ∞						-1850 175K			Volts Ohms
XV111	6080	210 480K	470 1M	300 23K	60 500K	260 470K	125 15K	Fil 0	Fil 0		Volts Ohms
XV112	6AR6		Fil 0	80 1M	125 15K	-5 500K		Fil 0	0 0		Volts Ohms
XV113	6080	210 480K	470 1M	300 23K	210 480	470 1M	300 23K	Fil 0	Fil 0		Volts Ohms
XV114	6080	60 500K	260 470K	125 15K	60 500K	260 470K	125 15K	Fil 0	Fil 0		Volts Ohms
XV115	12AX7	-5.2 500K	-87 45K	-85 72K	Fil 0	Fil 0	0 0	-85 87K	-85 72K	Fil 0	Volts Ohms
XV116	12AX7	210 450K	160 500K	160 28K	Fil 0	Fil 0	160 500K	0 0	0 80K	Fil 0	Volts Ohms
XV117	12AX7	60 500K	-.8 470K	0 0	Fil 0	Fil 0	-.8 470K	-50 60K	-50 42K	Fil 0	Volts Ohms
XV118	5651		-87 45K			0 0					Volts Ohms
XV101 Note 5	5R4		415 ∞		-235 ∞		-235 ∞		415 ∞		Volts Ohms
XV102 Note 5	5R4		-220 ∞		-925 100K		-925 100K		-220 ∞		Volts Ohms
XV103 Note 5	807	Fil 0	125 ∞	-7 220K	3 100	Fil 0					Volts Ohms
XV104 Note 5	807	Fil 0	125 ∞	-7 220K	3 100	Fil 0					Volts Ohms
XV105 Note 5	12AX7	-7 220K	-73 220K	-71 33K	Fil 0	Fil 0	-73 220K	-152 500K	-150 66K	Fil 0	Volts Ohms
XV106 Note 5	0A2	0 0						-150 66K			Volts Ohms
XV107 Note 5	0A2	325 50K						475 ∞			Volts Ohms

Note:
1. FIL. = 6.3 V AC between pins so marked.
2. Voltage readings taken with a 20,000 ohm-per-volt VOM between pin and ground.
3. Resistance readings taken with power cable removed.
4. STU-3WA, 4WA, 5WA operation.
5. STU-2WA operations.

(Cont'd)

TABLE 5-7. POWER SUPPLY CHASSIS VOLTAGE AND RESISTANCE MEASUREMENTS (Cont'd)

Socket	Tube Type	Pin Numbers 1	2	3	4	5	6	7	8	9	
XV108 Note 4	0A2	475 ∞						625 ∞			Volts Ohms
XV109 Note 4	0A2	625 ∞						775 ∞			Volts Ohms
XV110 Note 4	0A2	775 ∞						925 100K			Volts Ohms

TABLE 5-8. R-F TUNING UNITS STU-1WA, STU-2WA, STU-3WA, STU-4WA, STU-5WA VOLTAGE AND RESISTANCE MEASUREMENTS

Socket	Tube Type	Pin Numbers 1	2	3	4	5	6	7	8	9	
XV601	6AF4A	102 16.5K	-1.5 2.2K	Fil 0	Fil 0	0 0		102 16.5K			Volts Ohms
XV801	6BM6	-325 50K	Fil 50K	-325 50K	Fil 50K						Volts Ohms
XV802	6X4	Note 5		Fil 50K	Fil 50K		Note 5	-325 50K			Volts Ohms
XV901 XV1001 XV1101	5721	-1245 135K	Fil 125K	-1250 125K	Fil 125K						Volts Ohms
XV902 XV1002 XV1102	6X4	Note 5		Fil 125K	Fil 125K		Note 5	-1250 125K			Volts Ohms

Note:
1. FIL. = 6.3 V AC between pins so marked.
2. Voltage readings taken with a 20,000 ohm-per-volt VOM between pin and ground.
3. Resistance readings taken with power cable removed.
4. STU-2WA operations.
5. Readings depend upon setting of tuning control.

SECTION VI

PARTS LIST

6-1. INTRODUCTION.

6-2. This parts list provides an alpha-numerical listing, in reference symbol sequence of the replaceable electrical, certain electro-mechanical, and mechanical parts of the equipment.

6-3. ORDERING INFORMATION. Orders for parts should contain the following information:

a. Equipment name and model.
b. Serial number.
c. Reference symbol of part.
d. Manufacturer's part number and code.

6-4. HOW TO USE THE PARTS LIST.

6-5. An explanation of the structure of the parts list, Table 6-2, and the meaning of the entries in the five columns are given in the following paragraphs. (See Figure 6-1.)

1 2 3 4 5 6 7

SECTION VI
PARTS LIST

TABLE 6-1. PARTS LIST

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
B1 AND B2	BATTERY,DRY,1.5VDC	S036	CQ	2
C1	CAPACITOR,MICA,220UUF,5 PCT,300WVDC	CM15C221J	AU	1
C2	CAPACITOR,PAPER,1UF,20 PCT,400WVDC	620M	AC	1
C3	NOT USED			
C4	CAPACITOR,PAPER,0.033UF,10 PCT,600WVDC	6TM-S33	BN	1
C5	SAME AS C1			
C6 THRU C9	CAPACITOR,MICA,51UUF,5 PCT,500WVDC	CM20C510J	AU	1
F1 AND F2	FUSE,CARTRIDGE,DELAY,5AMP,3AG	313005	AP	2
H1	KNOB,RANGE SELECTOR	70-5-2G	BH	1

Figure 6-1. Parts List Example

6-6. REFERENCE SYMBOL COLUMN. The reference symbol column (1, Figure 6-1) contains the reference symbol assigned to each part, which also identifies the part on the schematic diagram or in an illustration. The listing is in alpha-numerical order.

6-7. DESCRIPTION COLUMN. The description column (2) contains the description for each part. When the same part is used more than once in the equipment, the second and subsequent listings for that part use the phrase "SAME AS ___" (4) in the description column and the remaining columns (5, 6, and 7) are left blank. When a reference symbol designation has not been used or its assignment has been cancelled, the description column contains the phrase "NOT USED" (3).

6-8. MANUFACTURER'S PART NUMBER COLUMN. The manufacturer's part number column (5) contains the part number assigned by the manufacturer of the part, except for "SAME AS ___" and "NOT USED" listings.

6-9. MANUFACTURER'S CODE COLUMN. The manufacturer's code column (6) contains a letter code identifying the manufacturer of the part. Table 6-1 contains a listing of the letter codes and the manufacturers names and addresses.

6-10. MAINTENANCE QUANTITY COLUMN. The maintenance quantity column (7) contains the recommended maintenance quantity for each part, based on a one year requirement for an equipment in operation for 10 hours a day throughout the year. The recommended maintenance quantities will provide a high degree of equipment reliability in areas where an adequate supply of replacement parts is not available. The recommended maintenance quantity is listed for the initial occurrence of the part in the parts list, but covers all subsequent listings.

6-11. To determine recommended maintenance quantity for periods other than one year, multiply the one-year quantity by the desired period, expressed in years.

6-12. To determine recommended maintenance quantity for operating periods other than 10 hours per day, use the equation given below.

$$MQ' = MQ \times \frac{HR_{op}}{10}$$

where: MQ = Maintenance quantity from Table 6-1

MQ' = Maintenance quantity for desired operating period

HR_{op} = Operating period in hours

Round off the quantity obtained to the nearest whole number.

TABLE 6-1. MANUFACTURER'S CODE

CODE	NAME AND ADDRESS
A	Aeronautical Standards Group, Dept. of Navy & Air Force, Washington, D. C.
B	Aerovox Corp., New Bedford, Mass.
C	Alden Products Co., Brockton, Mass.
D	Allen-Bradley Co., Milwaukee, Wis.
E	Amperite Co., New York, N. Y.
F	Amphenol Connector Division of Amphenol-Borg Electronics Corp., Chicago, Ill.
G	Belden Mfg. Co., Chicago, Ill.
H	Bendix Semiconductor Division of Bendix Corp., Holmdel, N. J.
J	Birnbach Radio Co., New York, N. Y.
K	Birtcher Corp., Los Angeles, Calif.
L	Boston Gear Works Division of Murray Co. of Texas, Boston, Mass.
M	Shallcross Mfg. Co., Selma, N. C.
N	Bourns Laboratories, Inc., Riverside, Calif.
P	Centralab Division of Globe-Union, Inc., Milwaukee, Wis.
Q	Chatam Electronics Division of Tung-Sol Electric, Inc., Livingston, N. J.
R	Cinch Mfg. Co., Division of United-Carr Fastener Corp., Chicago, Ill.
S	Clarostat Mfg. Co., Inc., Dover, N. H.
T	Condenser Products Co., Brooksville, Fla.
U	Cornell-Dubilier Electric Corp., Newark, N. J.
V	Dialight Corp., Brooklyn, N. Y.
W	Eby, S. E., Co., Philadelphia, Pa.
X	Elco Corp., Philadelphia, Pa.
Y	Erie Resistor Corp., Erie, Pa.
Z	General Electric Co., Miniature Lamp Department of Lamp Division of Consumer Products Group, Cleveland, Ohio
AA	General Electric Co., Semi-Conductor Products Department of Electronic Components Division of Electronic, Atomic and Defense Systems Group, Syracuse, N. Y.
AB	General Transistor Western Corp., Los Angeles, Calif.
AC	Good-All Electric Mfg. Co., Ogallala, Nebr.
AD	Hammarlund Co., Inc., New York, N. Y.
AE	Harvey Hubbell, Inc., Bridgeport, Conn.
AF	Helipot Division of Beckman Instruments,Inc., Fullerton, Calif.
AG	Hopkins Engineering Co., San Fernando, Calif.
AH	Hughes Products Division of Hughes Aircraft Co., Newport Beach, Calif.
AJ	International Resistance Co., Philadelphia, Pa.
AK	Jan Hardware Mfg. Co., Inc., Long Island City, N. Y.
AL	JBT Instruments Inc., New Haven, Conn.
AM	Kenyon Transformer Co., Inc., Jersey City, N. J.
AN	Kurman Electric Co., Inc., Brooklyn, N. Y.
AP	Littelfuse, Inc., Des Plaines, Ill.
AQ	Mallory Battery Co., North Tarrytown, N. Y.
AR	Mendelsohn Speed Gun Co., Haskell, N. J.
AS	James Millen Mfg. Co., Inc., Malden, Mass.
AT	J. W. Miller Co., Los Angeles, Calif.
AU	Military Specifications
AV	Military Standards
AW	Minor Rubber Co., Inc., Bloomfield, N. J.
AX	Micro Switch Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill.
AY	New Departure Division of General Motors Corp., Bristol, Conn.
AZ	Ohmite Mfg. Co., Skokie, Ill.
BA	Patton MacGuyer Co., Providence, R. I.
BB	Parker Kalon Division of General American Transportation Corp., Clifton, N. J.
BC	Pic Design Corp., East Rockaway, N. Y.

TABLE 6-1. MANUFACTURER'S CODE (CONT'D)

CODE	NAME AND ADDRESS
BD	Plastic Capacitors, Inc., Chicago, Ill.
BE	Polarad Electronics Corp., Long Island City, N.Y.
BF	Potter and Brumfield Division of American Machine and Foundry Co., Princeton, Ind.
BG	Pyramid Electric Co., Darlington, S.C.
BH	Raytheon Co., Industrial Components Division, Industrial Tube Operation, Newton, Mass.
BJ	RCA Semiconductor and Materials Division of Radio Corp. of America, Somerville, N.J.
BK	Ripley Co., Inc., Middletown, Conn.
BL	Sangamo Electric Co., Springfield, Ill.
BM	Shakeproof Division of Illinois Tool Works, Elgin, Ill.
BN	Sprague Electric Co., North Adams, Mass.
BP	Staver Co., Inc., Bay Shore, Long Island, N.Y.
BQ	Sterling Transformer Corp., Brooklyn, N.Y.
BR	Technitrol Engineering Co., Philadelphia, Pa.
BS	Telewave Laboratories, Inc., Long Island City, N.Y.
BT	Times Facsimile Corp., New York, N.Y.
BU	Transitron Electronic Corp., Wakefield, Mass.
BV	Ucinite Co., Newtonville, Mass.
BW	United Transformer Co., New York, N.Y.
BX	Utah Radio Products Corp., Huntington, Ind.
BY	Vector Mfg. Co., Houston, Tex.
BZ	Victory Engineering Corp., Springfield, N.J.
CA	Waldes Kohinoor, Inc., Long Island City, N.Y.
CB	Weckesser Co., Chicago, Ill.
CC	Winchester Electronics Co., Inc., Norwalk, Conn.
CD	Cutler-Hammer, Inc., Milwaukee, Wis.
CE	Olsen Machine and Tool Co., North Abington, Mass.
CF	Cannon Electric Co., Los Angeles, Calif.
CG	Arco Electronics, Inc., Great Neck, N.Y.
CH	Cambridge Thermionic Corp., Cambridge, Mass.
CJ	Sylvania Electric Products, Inc., Semiconductor Division, Woburn, Mass.
CK	Commercially Available Component
CL	Stackpole Carbon Co., St. Marys, Pa.
CM	Astron Co., East Newark, N.J.
CN	Sarkes Tarzian, Inc., Bloomington, Ind.
CP	Arrow Hart and Hegeman Electric Co., Hartford, Conn.
CQ	Radio Corp. of America, New York, N.Y.
CR	Allied Control Co., Inc., New York, N.Y.
CS	Sylvania Electric Products, Inc., New York, N.Y.
CT	Leach Corp., Leach Relay Co. Division, Los Angeles, Calif.
CU	Triplett Electrical Instrument Co., Bluffton, Ohio
CV	Bliley Electric Co., Inc., Erie, Pa.
CW	Switchcraft, Inc., Chicago, Ill.
CX	Industrial Products Co., Division of Amphenol-Borg Electronics Corp., Danbury, Conn.
CY	Mepco Division of Sessions Clock Co., Morristown, N.J.
CZ	Resistance Products Co., Harrisburg, Pa.
DA	Continental-Wirt Electronics Corp., Philadelphia, Pa.
DB	Ward Leonard Electric Co., Mount Vernon, N.Y.
DC	Superex Electronics Corp., Yonkers, N.Y.
DD	Oak Mfg. Co., Crystal Lake, Ill.
DE	National Radio Co., Inc., Malden, Mass.

TABLE 6-1. MANUFACTURER'S CODE (CONT'D)

CODE	NAME AND ADDRESS
DF	Wright Electronics, Inc., Kansas City, Mo.
DG	Torrington Mfg. Co., Torrington, Conn.
DH	Union Electronics, Long Island City, N.Y.
DJ	Applied Research, Inc., Port Washington, N.Y.
DK	Ferroxcube Corp. of America, Saugerties, N.Y.
DL	Technology Instrument Corp., Acton, Mass.
DM	Allen B. DuMont Laboratories, Inc., New York, N.Y.
DN	Amperex Electronic Co., Division of North American Philips Co., Inc., Hicksville, N.Y.
DP	Industrial Condenser Corp., Chicago, Ill.
DQ	International Rectifier Corp., El Segundo, Calif.
DR	CTS Corp., Elkhart, Ind.
DS	General Radio Co., West Concord, Mass.
DT	Microlab, Inc., Livingston, N.J.
DU	Comar Electric Co., Chicago, Ill.
DV	Film Capacitors, Inc., New York, N.Y.
DW	FXR Division of Amphenol-Borg Electronics Corp., Danbury, Conn.
DX	Britton Electronics Corp., Mount Vernon, N.Y.
DY	Chicago Standard Transformer Corp., Chicago, Ill.
DZ	Mallory, P.R., and Co., Inc., Indianapolis, Ind.
EA	Automatic Metal Products Co., Brooklyn, N.Y.
EB	Dale Electronics, Inc., Columbus, Nebr.
EC	Gulton Industries, Inc., Metuchen, N.J.
ED	International Electronic Industries, Inc., Nashville, Tenn.
EE	Clairtron Mfg. Co., Orange, N.J.
EF	Technical Apparatus Builders, New York, N.Y.
EG	Bussmann Fuse Division of McGraw-Edison Co., St. Louis, Mo.
EH	The Superior Electric Co., Bristol, Conn.
EJ	Rotron Mfg. Co., Inc., Woodstock, N.Y.
EK	Jeffers Electronics Division of Speer Carbon Co., DuBois, Pa.
EL	JFD Electronics Corp., Brooklyn, N.Y.
EM	Essex Electronics Division of Nytronics Inc., Berkeley Heights, N.J.
EN	Torotel, Inc., Kansas City, Mo.
EP	Texas Instruments Inc., Dallas, Texas
EQ	Wells Electronics Co., South Bend, Ind.
ER	Thordarson-Meissner Division of Maguire Industries, Inc., Mount Carmel, Ill.
ES	Piezo Crystal Co., Carlisle, Pa.
ET	Pacific Semiconductors, Inc., Hawthorne, Calif.
EV	Fasco Industries, Inc., Rochester, N.Y.
EW	Triad Transformer Corp., Venice, Calif.
EX	National Tel Tronics Corp., Yonkers, N.Y.
EY	Carling Electric, Inc., Hartford, Conn.
EZ	E.F. Johnson Co., Waseca, Minn.
FA	Thomas Electronics, Inc., Passaic, N.J.
FB	Merit Coil and Transformer Corp., Hollywood, Fla.
FC	Aladdin Electronics Division of Aladdin Industries, Inc., Nashville, Tenn.
FE	Sperry Semiconductor Division of Sperry Rand Corp., Norwalk, Conn.
FF	Corning Glass Works, Electronic Components Department, Bradford, Pa.
FG	Duncan Electronics, Inc., Santa Ana, Calif.
FH	Advance Electronics Laboratories, Inc., Passaic, N.J.
FJ	Fastex Division of Illinois Tool Works, Des Plaines, Ill.

TABLE 6-1. MANUFACTURER'S CODE (CONT'D)

CODE	NAME AND ADDRESS
FK	Motorola, Inc., Semiconductor Products Division, Phoenix, Ariz.
FL	Electro Motive Mfg. Co., Willimantic, Conn.
FM	Varian Associates, Palo Alto, Calif.
FN	Quality Components, Inc., St. Marys, Pa.
FP	Automatic Mfg. Corp., Newark, N.J.
FQ	Electra Mfg. Co., Kansas City, Mo.
FR	Dage Electric Co., Inc., Beech Grove, Ind.
FS	The Cornish Wire Co., New York, N.Y.
FT	RLC Electronics, Inc., Mamaroneck, N.Y.
FU	Fairchild Camera and Instrument Corp., Semiconductor Division, Mountain View, Calif.
FV	Burnell and Co., Inc., Pelham Manor, N.Y.
FW	Dearborn Electronic Laboratories, Inc., Orlando, Fla.
FX	Weston Instruments, Division of Daystrom, Inc., Newark, N.J.
FY	HI-Q Division of Aerovox Corp., Myrtle Beach, S.C.
FZ	Electric Regulator Corp., South Norwalk, Conn.
GA	Simpson Electric Co., Chicago, Ill.
GB	Control Switch Division, Controls Co. of America, Chicago, Ill.
GC	Semicon, Inc., Bedford, Mass.
GD	Filtron Co., Inc., Flushing, Long Island, N.Y.
GE	Rotating Components, Inc., Brooklyn, N.Y.
GF	Transco Products, Inc., Los Angeles, Calif.
GG	Thompson Ramo Wooldridge, Inc., Cleveland, Ohio
GH	PRD Electronics, Inc., Brooklyn, N.Y.
GJ	Solitron Devices, Inc., Norwood, N.J.
GK	Valpey Crystal Co., Holliston, Mass.
GL	Sage Laboratories, Inc., Natick, Mass.
GM	J.H. Williams and Co., Buffalo, N.Y.
GN	Kings Electronics Co., Inc., Tuckahoe, N.Y.
GP	ITT Federal Division of International Telephone and Telegraph Corp., Clifton, N.J.
GQ	Herman H. Smith, Inc., Brooklyn, N.Y.
GR	Leecraft Mfg. Co., Inc., New York, N.Y.

TABLE 6-2. PARTS LIST

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
AT301	ATTENUATOR ASSY	B137218	BE	1
A101	POWER SUPPLY ASSY	D131633	BE	1
A201	NARROW BAND ASSY,USED ON SERIAL NOS. 595 THRU 634	D127647	BE	1
A201	NARROW BAND ASSY,USED ON SERIAL NOS. 635 AND UP	D137221		1
A301	MARKER OSCILLATOR ASSY	D135352	BE	1
A401	SWEEPER ASSY	D128004	BE	1
A501	VIDEO ASSY	D132282	BE	1
A601	CRT SUPPLY ASSY	D128757	BE	1
A701	WIDE BAND ASSY	D126910	BE	1
A801	CONTROL AMPLIFIER ASSY	D141460	BE	1
B101	FAN ASSY,AXIAL,115VAC,50-60CPS	C146653	BE	1
B101A	MOTOR,FAN,SYNCHRONOUS,115VAC,50-60CPS, USED ON MODEL TSA-WF ONLY	B103377	BE	1
B101A	MOTOR,FAN,SYNCHRONOUS,115VAC,50-60CPS PART OF B101	BP22146	BE	1
B101B	IMPELLER,CCW ROTATION,REAR MOUNTED HUB, PART OF B101/POLARAD PART NO. B706977	520-402	DG	1
CR101	SEMICONDUCTOR DEVICE,DIODE,ZENER	1N2970A	CK	1
CR102 THRU CR109	SEMICONDUCTOR DEVICE,DIODE,SILICON /POLARAD PART NO. B707117	CER-71	GJ	16
CR110	SEMICONDUCTOR DEVICE,DIODE,GERMANIUM /POLARAD PART NO. A27794	4JA211AB1AC1	AA	1
CR111 THRU CR114	SAME AS CR102			
CR115	SEMICONDUCTOR DEVICE, RECTIFIER,SILICON	1N1341	CK	1
CR116 THRU CR120	NOT USED			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
CR121 AND CR122	SAME AS CR102			
CR201	SEMICONDUCTOR DEVICE,DIODE,GERMANIUM	1N69	CK	2
CR401	NOT USED			
CR402	SEMICONDUCTOR DEVICE,DIODE,GERMANIUM	1N82A	CK	1
CR501	SAME AS CR201			
CR502 THRU CR508	SEMICONDUCTOR DEVICE,DIODE,GERMANIUM	1N198	CK	7
CR509 AND CR510	NOT USED			
CR511 AND CR512	SAME AS CR121			
C1 THRU C74	NOT USED			
C75	CAPACITOR,CERAMIC,0.1UF,PLUS 80 PCT, MINUS 20 PCT,500WVDC/POLARAD PART NO. B702290	41C92	BN	1
C101 AND C102	CAPACITOR,PLASTIC,4UF,10 PCT,2000WVDC /POLARAD PART NO. B506803	0E-20-405	BD	1
C103	CAPACITOR,PLASTIC,2UF,10 PCT,3000WVDC /POLARAD PART NO. B506806	0E-30-205	BD	1
C104	CAPACITOR,PLASTIC,0.5UF,10 PCT,2000WVDC	0E-20-504	BC	1
C105 THRU C107	CAPACITOR,ELECTROLYTIC,DUAL SECT,40UF, PLUS 50 PCT,MINUS 10 PCT,450WVDC,EACH SECT	17D-15	BN	1
C108	CAPACITOR,PAPER,2UF,10 PCT,600WVDC	CP53B1EF205K	AU	1
C109	SAME AS C105			
C110	CAPACITOR,ELECTROLYTIC,2UF,450WVDC /POLARAD PART NO. C511351	TVA-1701	BN	1
C111	SAME AS C108			
C112	SAME AS C110			
C113	CAPACITOR,PLASTIC,0.25UF,10 PCT,200WVDC /POLARAD PART NO. B508732	2TM-P25	BN	1

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C114	CAPACITOR,PAPER,0.05UF,20 PCT,1600WVDC /POLARAD PART NO. A701672	BP-16-05	CM	1
C115	CAPACITOR,PLASTIC,0.05UF,10 PCT,400WVDC /POLARAD PART NO. B508825	4TM-S50	BN	1
C116	SAME AS C110			
C117 AND C118	NOT USED			
C119	CAPACITOR,CERAMIC,0.05UF,20 PCT,500WVDC	5HK-S50	BN	1
C120	CAPACITOR,PLASTIC,1UF,10 PCT,200WVDC /POLARAD PART NO. B508735	2TM-M10	BN	1
C121	SAME AS C110			
C122 AND C123	NOT USED			
C124	SAME AS C119			
C125 THRU C138	NOT USED			
C139 AND C140	CAPACITOR,ELECTROLYTIC,2000UF,15WVDC /POLARAD PART NO. B706319	BR200015	U	1
C141 AND C142	CAPACITOR,CERAMIC,1000UUF,10 PCT,1000WVDC /POLARAD PART NO. A701560	DD-102	P	3
C143 THRU C150	NOT USED			
C151	CAPACITOR,PAPER,0.5UF,10 PCT,600WVDC, USED ON MODEL TSA-WF ONLY	CP54B1EF504K	AU	1
C152 THRU C169	NOT USED			
C170 AND C171	SAME AS C139			
C172	NOT USED			
C173	SAME AS C108			
C201	CAPACITOR,MICA,560UUF,5 PCT,300WVDC	CM15C560J	AU	1
C202 AND C203	SAME AS C141			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C204	CAPACITOR,MICA,1000UUF,10 PCT,300WVDC, USED ON SERIAL NOS. 595 THRU 634	CB21QX102K	AU	1
C204	CAPACITOR,MICA,1000UUF,10 PCT,500WVDC, /POLARAD PART NO. B706815/USED ON SERIAL NOS. 635 AND UP	370FC-102K	Y	1
C205	CAPACITOR,MICA,43UUF,5 PCT,300WVDC	CM15C430J	AU	1
C206 AND C207	SAME AS C141			
C208	CAPACITOR,CERAMIC,0.01UF,PLUS 100 PCT, MINUS 20 PCT,500WVDC,USED ON SERIAL NOS. 595 THRU 634	CK63Y103Z	AU	2
C208	CAPACITOR,CERAMIC,0.01UUF,GMV,600WVDC /POLARAD PART NO. B705176/USED ON SERIAL NOS. 635 AND UP	DD6-103	P	2
C209	SAME AS C141			
C210	NOT USED			
C211	CAPACITOR,MICA,120UUF,10 PCT,500WVDC USED ON SERIAL NOS. 595 THRU 634	DM15E121K	CG	1
C211	CAPACITOR,MICA,120UUF,5 PCT,500WVDC /POLARAD PART NO. B703086/USED ON SERIAL NOS. 635 AND UP	DM15F121J	CG	1
C212	SAME AS C141			
C213	NOT USED			
C214	SAME AS C208,USED ON SERIAL NOS. 595 THRU 634			
C214	SAME AS C208,USED ON SERIAL NOS. 635 AND UP			
C215	NOT USED			
C216 AND C217	SAME AS C141			
C218 AND C219	SAME AS C208,USED ON SERIAL NOS. 595 THRU 634			
C218 AND C219	SAME AS C208,USED ON SERIAL NOS. 635 AND UP			
C220	NOT USED			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C221	CAPACITOR,MICA,330UUF,5 PCT,300WVDC	CM15C331J	AU	1
C222	SAME AS C204,USED ON SERIAL NOS. 595 THRU 634			
C222	SAME AS C204,USED ON SERIAL NOS. 635 AND UP			
C223	SAME AS C141			
C224	CAPACITOR,MICA,180UUF,10 PCT,500WVDC, USED ON SERIAL NOS. 595 THRU 634	DM15E181K	CG	1
C224	CAPACITOR,MICA,180UUF,5 PCT,500WVDC /POLARAD PART NO. B703090/USED ON SERIAL NOS. 635 AND UP	DM15F181J	CG	1
C225	CAPACITOR,MICA,1500UUF,5 PCT,500WVDC	CM30E152J	AU	1
C226	SAME AS C204,USED ON SERIAL NOS. 595 THRU 634			
C226	SAME AS C204,USED ON SERIAL NOS. 635 AND UP			
C227	CAPACITOR,MICA,47UUF,10 PCT,500WVDC /POLARAD PART NO. B703022	DM15E470K	AU	1
C228 AND C229	SAME AS C208,USED ON SERIAL NOS. 595 THRU 634			
C228 AND C229	SAME AS C208,USED ON SERIAL NOS. 635 AND UP			
C230	NOT USED			
C231 THRU C233	SAME AS C208,USED ON SERIAL NOS. 595 THRU 634			
C231 THRU C233	SAME AS C208,USED ON SERIAL NOS. 635 AND UP			
C234	SAME AS C221			
C235	SAME AS C141			
C236 AND C237	SAME AS C208,USED ON SERIAL NOS. 595 THRU 634			
C236 AND C237	SAME AS C208,USED ON SERIAL NOS. 635 AND UP			
C238	SAME AS C208,USED ON SERIAL NOS. 635 AND UP			
C239	SAME AS C208,USED ON SERIAL NOS. 595 THRU 634			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C239	SAME AS C208, USED ON SERIAL NOS. 635 AND UP			
C240 AND C241	NOT USED			
C242	SAME AS C208, USED ON SERIAL NOS. 595 THRU 634			
C242	SAME AS C208, USED ON SERIAL NOS. 635 AND UP			
C243	SAME AS C208, USED ON SERIAL NOS. 635 AND UP			
C244	CAPACITOR, CERAMIC, FEED-THRU, 1000UUF, 20 PCT, 500WVDC/POLARAD PART NO. A506409	327-102	Y	2
C245	SAME AS C221, USED ON SERIAL NOS. 635 AND UP			
C246	CAPACITOR, MICA, 6800UUF, 5 PCT, 300WVDC, USED ON SERIAL NOS. 595 THRU 634	CM35C682J	AU	1
C246	SAME AS C141, USED ON SERIAL NOS. 635 AND UP			
C247	SAME AS C208, USED ON SERIAL NOS. 595 THRU 634			
C247	SAME AS C208, USED ON SERIAL NOS. 635 AND UP			
C248	SAME AS C244			
C249	CAPACITOR, MICA, 33UUF, 5 PCT, 300WVDC, USED ON SERIAL NOS. 595 THRU 634	CM15C330J	AU	1
C249	CAPACITOR, CERAMIC, 51UUF, 2 PCT, 300WVDC, USED ON SERIAL NOS. 635 AND UP	CC21UJ510G	AU	1
C250 AND C251	NOT USED			
C252	SAME AS C244			
C253	CAPACITOR, MICA, 22UUF, 10 PCT, 500WVDC	CM15E220K	AU	1
C254	SAME AS C227			
C255	SAME AS C141			
C301	CAPACITOR, CERAMIC, 1000UUF, 10 PCT, 500WVDC	831	Y	1
C302	CAPACITOR, VARIABLE, AIR DIELECTRIC, 3-13UUF /POLARAD PART NO. A106573	33800-37	AD	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C303	CAPACITOR,VARIABLE,CERAMIC,1.5-7UUF,500WVDC	557-A	U	1
C304	CAPACITOR,CERAMIC,2.2UUF,0.2UUF TOL,600WVDC	NP0A-2R2	Y	1
C305	CAPACITOR,VARIABLE,CERAMIC,1.5-7UUF, 0.5UUF TOL,600WVDC	822-EZ	P	1
C306 THRU C309	NOT USED			
C310	SAME AS C301			
C311	CAPACITOR,CERAMIC,22UUF,20 PCT,600WVDC	GP1K	Y	1
C312	CAPACITOR,VARIABLE,AIR DIELECTRIC, 1.5-5UUF,1100WVDC	A121010	BE	1
C401	NOT USED			
C402	SAME AS C244			
C403	NOT USED			
C404	CAPACITOR,CERAMIC,27UUF,2 PCT,500WVDC	CC20SH270G	AU	1
C405	CAPACITOR,CERAMIC,1UUF,10 PCT,500WVDC /POLARAD PART NO. B701922	GA-1	CL	1
C406	SAME AS C244			
C407 THRU C410	NOT USED			
C411 AND C412	CAPACITOR,CERAMIC,47UUF,2 PCT,500WVDC	CC20UJ470G	AU	1
C413	SAME AS C244			
C414	CAPACITOR,CERAMIC,4.7UUF,10 PCT,500WVDC /POLARAD PART NO. B701930	GA-4.7	CL	1
C415	SAME AS C201			
C416	SAME AS C141			
C417	SAME AS C201			
C418 THRU C421	SAME AS C141			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C422	SAME AS C244			
C423	SAME AS C244.USED ON SERIAL NOS. 595 THRU 634			
C424	NOT USED			
C425 AND C426	SAME AS C244			
C427	SAME AS C141			
C428	SAME AS C405			
C429	NOT USED			
C430 THRU C432	SAME AS C141			
C433	SAME AS C75			
C434	NOT USED			
C435	SAME AS C75			
C436	CAPACITOR,CERAMIC,3.3UUF,10 PCT,500WVDC /POLARAD PART NO. B701928	GA-3.3	CL	1
C437	NOT USED			
C438	CAPACITOR,ELECTROLYTIC,8UF,10 PCT,450WVDC /POLARAD PART NO. B703544	BR8-450	U	1
C439	CAPACITOR,MICA,1000UUF,10 PCT,500WVDC /POLARAD PART NO. B706815	370FC-102K	Y	1
C440 AND C441	SAME AS C141			
C442	SAME AS C439			
C443 AND C444	SAME AS C141			
C445 THRU C454	NOT USED			
C455	CAPACITOR,CERAMIC,0.01UF,GMV,600WVDC /POLARAD PART NO. B705177	DD-103	P	1
C501	SAME AS C141			

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C502	CAPACITOR,PLASTIC,0.1UF,10 PCT,400WVDC /POLARAD PART NO. B508828	4TM-P10	BN	1
C503	CAPACITOR,PLASTIC,0.022UF,10 PCT,400WVDC /POLARAD PART NO. B508819	4TM-S22	BN	1
C504	CAPACITOR,PLASTIC,0.02UF,10 PCT,400WVDC /POLARAD PART NO. B508818	4TM-S20	BN	1
C505	SAME AS C115			
C506	CAPACITOR,PAPER,1UF,10 PCT,600WVDC	CP61B1FF105K	AU	1
C507	CAPACITOR,PLASTIC,0.01UF,10 PCT,400WVDC /POLARAD PART NO. B508816	4TM-S10	AU	1
C508	CAPACITOR,CERAMIC,0.1UF,20 PCT,500WVDC	5HK-P10	BN	1
C509	CAPACITOR,MICA,33UUF,5 PCT,300WVDC	CM15C330J	AU	1
C510	NOT USED			
C511	CAPACITOR,MICA,15UUF,5 PCT,300WVDC	CM15C150J	AU	1
C512	CAPACITOR,VARIABLE,CERAMIC,7-45UUF,500WVDC	CV11C450	AU	1
C513	SAME AS C508			
C514	CAPACITOR,PAPER,1UF,PLUS 20 PCT, MINUS 10 PCT,200WVDC/POLARAD PART NO. 508735	330210	BL	1
C515	NOT USED			
C516	SAME AS C75,USED ON MODEL TSA-WF ONLY			
C516	CAPACITOR,CERAMIC,0.03UF,PLUS 80 PCT, MINUS 20 PCT,600WVDC/POLARAD PART NO. B705179	DD-303	P	1
C601 THRU C615	NOT USED			
C616 C617	SAME AS C75			
C618	SAME AS C455			
C619	SAME AS C141			
C620	NOT USED			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C621	CAPACITOR,MICA,1000UUF,U0 PCT,1000WVDC	VCM20B102K	U	1
C622 AND C623	CAPACITOR,CERAMIC,0.01UF 20 PCT,3000WVDC /POLARAD PART NO.A700582	41C121A2	BN	1
C624 AND C625	NOT USED			
C626 AND C627	CAPACITOR,PLASTIC,0.1UF,10 PCT,3000WVDC	D6-30-100	DV	1
C701 THRU C705	CAPACITOR,CERAMIC,1000UUF,PLUS 100 PCT, MINUS 20 PCT,500WVDC	CK61Y102Z	AU	3
C706	SAME AS C439			
C707 THRU C727	SAME AS C701			
C728 THRU C730	SAME AS C244			
C731 THRU C738	NOT USED			
C739	CAPACITOR,CERAMIC,0.56UUF,10 PCT,500WVDC /POLARAD PART NO. B701919	GA-.56	CL	1
C740	NOT USED			
C741	CAPACITOR,VARIABLE,CERAMIC,1.5-12.5UUF, 500WVDC/POLARAD PART NO. A107118	PCST-50	CH	1
C801	CAPACITOR,CERAMIC,TEMP COMP, 51UUF,0.5UUF TOL,600WVDC	TCN-51	P	1
C802 AND C803	CAPACITOR,VARIABLE,CERAMIC,3-13UUF,500WVDC	CV11A130	Y	1
C804 THRU C806	CAPACITOR,CERAMIC,0.01UF,20 PCT,1000WVDC	5HK-S10	BN	1
C807	SAME AS C244			
C808	SAME AS C804			
C809 AND C810	SAME AS C141			
C811	SAME AS C804			

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C812	SAME AS C244			
DS1 THRU DS75	NOT USED			
DS76	LAMP,INCANDESCENT,6-8V,BAYONET BASE	328	CK	1
DS77 THRU DS80	LAMP,INCANDESCENT,6-8V,BAYONET BASE /POLARAD PART NO. 005237	47	CK	1
FE201 THRU FE203	FERRITE BEAD/POLARAD PART NO. A115516	56-590-65/3B	DK	1
FE301 AND FE302	SAME AS FE201			
FE401 THRU FE405	SAME AS FE201			
FE406	SAME AS FE201,USED ON SERIAL NOS. 635 AND UP			
FE701 THRU FE705	SAME AS FE201			
FE801 AND FE802	SAME AS FE201			
FL301 AND FL302	FILTER,RF,2500UUF,20 PCT,500WVDC /POLARAD PART NO. A118602	FIB	D	1
F101 AND F102	FUSE,CARTRIDGE,6.25 AMP /POLARAD PART NO. B704813	MDL-6.25	EG	2
F103	FUSE,CARTRIDGE,DELAY,2 AMP,3AG	MS90078-26	AV	1
F104	FUSE,CARTRIDGE,DELAY,3 AMP,3AG	MS90078-27	AV	1
H101 THRU H103	KNOB/POLARAD PART NO. 517206	70-2-2	BN	1
H104	KNOB/POLARAD PART NO. 517211	70-3-2	BH	1
H105	KNOB/POLARAD PART NO. 507403	70-5-2	BH	1
H106	KNOB	A138396	BE	1
H107 AND H108	KNOB	A138335	BE	1
H109 AND H110	KNOB	A115356	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
H111 THRU H113	KNOB	A132301	BE	1
H114	SAME AS H105			
H115 THRU H118	KNOB/POLARAD PART NO. A132300	90-1-2	BH	1
H119 AND H120	KNOB/POLARAD PART NO. A132299	70-1-2	BH	1
J1 THRU J74	NOT USED			
J75 THRU J78	CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE	UG-625/U	AU	2
J79 THRU J84	NOT USED			
J85 AND J86	CONNECTOR,PLUG,FEMALE,BNC TYPE	UG-909/U	AU	1
J101 THRU J124	NOT USED			
J125	CONNECTOR,RECEPTACLE,FEMALE,34 PINS /POLARAD PART NO. 516112	MRE-34S-G	CC	1
J126	NOT USED			
J127	CONNECTOR,RECEPTACLE,MALE,3 PINS /POLARAD PART NO. A700010	7486	AE	1
J128	CONNECTOR,PLUG,MALE,3 PINS /POLARAD PART NO. AK50123	91-MPM3S	F	1
J201 AND J202	SAME AS J75			
J203	CONNECTOR,RECEPTACLE,FEMALE,7 PINS /POLARAD PART NO. B516005	A7S	CC	1
J203	SAME AS J75,USED ON SERIAL NOS. 595 THRU 634			
J204	SAME AS J75			
J205	SAME AS J75,USED ON SERIAL NOS. 635 AND UP			
J301	SAME AS J203,PART NO. A7S			

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
J302	SAME AS J75•WITH COIL L304			
J401	CONNECTOR•RECEPTACLE•FEMALE•15 PINS /POLARAD PART NO• 516007	A15S	CC	1
J402 THRU J404	SAME AS J75			
J501 AND J502	SAME AS J75			
J503	CONNECTOR•PLUG•MALE•26 PINS /POLARAD PART NOS•A139046	MRE-26P-G	CC	1
J504	SAME AS J203•PART NO• A7S			
J601 THRU J610	NOT USED			
J611	SAME AS J401			
J701 THRU J703	SAME AS J75			
J704	SAME AS J203•PART NO• A7S			
J801	CONNECTOR•RECEPTACLE•FEMALE•BNC TYPE	UG-625A/U	AU	1
J802	CONNECTOR•RECEPTACLE•FEMALE•BNC TYPE•RT•ANGLE	UG-1098/U	AU	1
J803	CONNECTOR•RECEPTACLE•FEMALE•5 PINS /POLARAD PART NO• C509729	M5S-LRN	CC	1
K101	RELAY•THERMAL•DELAY•SPST•115VAC	115N060T	E	1
K102	RELAY•ARMATURE•DPDT	D0X-46T	AZ	1
K501	RELAY•ARMATURE•3PDT•110VAC /POLARAD PART NO• A135339	XM-310	DU	1
L201	NOT USED			
L202	COIL•RF•VARIABLE	A100969	BE	1
L203	COIL•RF•5UH	A100676	BE	1
L204	NOT USED			
L205	COIL•RF•VARIABLE	A100822	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
L206	NOT USED			
L207	COIL,RF,50UH	A101170	BE	1
L208	NOT USED			
L209	COIL,RF,VARIABLE	A111193	BE	1
L210	NOT USED			
L211	COIL,RF,100UH	A101169	BE	1
L212	SAME AS L203			
L213	COIL,RF,VARIABLE USED ON SERIAL NOS. 595 THRU 634	A116977	BE	1
L213	COIL,RF,VARIABLE, USED ON SERIAL NOS. 635 AND UP	A100970	BE	1
L214	NOT USED			
L215	SAME AS L203			
L216	SAME AS L209			
L217 AND L218	SAME AS L211			
L219	SAME AS L209,USED ON SERIAL NOS. 635 AND UP			
L220	NOT USED			
L221	SAME AS L211			
L222	COIL,RF,5MH,USED ON SERIAL NOS. 595 THRU 634	M50	DC	1
L222	COIL,RF,2.5MH/POLARAD PART NO. A106494/ USED ON SERIAL NOS. 635 AND UP	R50	DC	1
L223	COIL,RF,VARIABLE ASSY,USED ON SERIAL NOS. 595 THRU 634	B141458	BE	1
L223	SAME AS L211,USED ON SERIAL NOS. 635 AND UP			
L224	NOT USED			
L225	COIL,RF,USED ON SERIAL NOS. 635 AND UP	A146633	BE	1

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
L301	NON-REPLACEABLE PART OF L302			
L302	COIL,RF,5UH,WITH COIL L301	ASK13335	BE	1
L303	COIL,RF,VARIABLE	ASK13336	BE	1
L304	NON-REPLACEABLE PART OF J302			
L401	COIL,RF,10MH,USED ON SERIAL NOS. 635 AND UP	A146621	BE	1
L402	NOT USED			
L403	REACTOR,INDUCTIVELY COUPLED TO L405	B111355	BE	1
L404	NOT USED			
L405	REACTOR,INDUCTIVELY COUPLED TO L403	A127996	BE	1
L406	COIL,RF,VARIABLE	A127659	BE	1
L407	COIL,RF	A127997	BE	1
L408	COIL,RF,VARIABLE	A127660	BE	1
L409	COIL,RF,VARIABLE	A131643	BE	1
L410 AND L411	COIL,RF,0.8UH	A100674	BE	1
L501	COIL,RF,2.5UH	M-25	DC	1
L601	COIL,RF,4.7MH	R40-4-7	DE	1
L701	COIL,RF,VARIABLE	A127094	BE	1
L702	COIL,RF,VARIABLE	A127096	BE	1
L703	COIL,RF,VARIABLE	A127095	BE	1
L704	SAME AS L702			
L705	SAME AS L703			
L706	SAME AS L702			
L707	COIL,RF,VARIABLE	A127097	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
L708	COIL,RF	A114575	BE	1
L709	COIL,RF	A132585	BE	1
L710	COIL,RF	A127099	BE	1
L711	COIL,RF	A127098	BE	1
L712	COIL,RF	A127101	BE	1
L713	SAME AS L711			
L714	SAME AS L712			
L715	SAME AS L711			
L716	SAME AS L712			
L717 AND L718	COIL,RF,0.6UH	AP21030-3	BE	1
L719	COIL,RF	A144026	BE	1
L801 AND L802	NOT USED			
L803	COIL,RF,VARIABLE	B141448	BE	1
L804 THRU L806	SAME AS L207			
MP1	SCALE,CRT,CALIBRATED	BP21124	BE	1
MP2	SHIELD,CRT,SPECIAL PURPOSE	BP18588	BE	1
MP3	BEZEL,CRT	CP19495	BE	1
MP4	FILTER,CRT,BLUE	B27336-2	BE	1
P1 THRU P84	NOT USED			
P85 AND P86	CONNECTOR,PLUG,MALE,BNC TYPE /POLARAD PART NO.A701977	8525	CX	1
P101 THRU P103	NOT USED			
P104	CONNECTOR,PLUG,FEMALE,18 PINS,WITH HOOD A18-H	SA18S-H	CC	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
P105 THRU P124	NOT USED			
P125	CONNECTOR,PLUG,MALE,34 PINS,WITH HOOD MRE-34H /POLARAD PART NO. A516111	MRE-34P-G	CC	1
P126 AND P127	NOT USED			
P128	CONNECTOR,PLUG,FEMALE,3 PINS /POLARAD PART NO. AK50124	91-MPF3S	F	1
P201 AND P202	CONNECTOR,PLUG,MALE,BNC TYPE	UG-260/U	AU	1
P203	CONNECTOR,PLUG,MALE,7 PINS,WITH HOOD A7H	A7P-H	CC	1
P203	CONNECTOR,PLUG,MALE,BNC TYPE, USED ON SERIAL NOS. 595 THRU 634	UG-88/U	AU	1
P204	CONNECTOR,PLUG,MALE,BNC TYPE	UG-88/U	AU	1
P205	SAME AS P204,USED ON SERIAL NOS. 635 AND UP			
P301	SAME AS P203,PART NO. A7P-H			
P302	SAME AS P204			
P401	CONNECTOR,PLUG,MALE,15 PINS,WITH HOOD A15H	A15P-H	CC	1
P402 AND P403	SAME AS P201			
P404	SAME AS P204			
P501 AND P502	SAME AS P201			
P503	CONNECTOR,PLUG,FEMALE,26 PINS, WITH HOOD MRE-26H-1	MRE-26S-G	CC	1
P504	SAME AS P203,PART NO. A7P-H			
P601 THRU P606	NOT USED			
P607	SAME AS P201			
P608 THRU P610	NOT USED			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
P611	SAME AS P401			
P701	SAME AS P201			
P702 AND P703	SAME AS P204			
P704	SAME AS P203,PART NO. A7P-H			
P801 AND P802	SAME AS P204			
P803	CONNECTOR,PLUG,MALE,5 PINS,WITH HOOD /POLARAD PART NO. C509706	M5P-LSH19C	CC	1
Q101	TRANSISTOR,PNP,GERMANIUM	2N277	CK	1
R1 THRU R75	NOT USED			
R76	RESISTOR,VARIABLE,COMPOSITION,500K,10 PCT,2W /POLARAD PART NO. 517927	RV4NAXSD504A	AU	1
R77	RESISTOR,VARIABLE,WW,10 OHMS,10 PCT,5W	A129119	BE	1
R78	RESISTOR,VARIABLE,COMPOSITION,500K,10 PCT,2W /POLARAD PART NO. 517916	RVNAXSB504A	AU	1
R79	RESISTOR,VARIABLE,COMPOSITION,5 MEGO,20 PCT, 2W/POLARAD PART NO. 517922	RV4NAXSB505B	AU	1
R80	NOT USED			
R81	SAME AS R76,USED ON SERIAL NOS. 635 AND UP			
R101	RESISTOR,COMPOSITION,0.1K,10 PCT,1/2W	RC20GF101K	AU	3
R102	RESISTOR,COMPOSITION,470K,10 PCT,1/2W	RC20GF474K	AU	2
R103	SAME AS R101			
R104	RESISTOR,COMPOSITION,33K,10 PCT,1W	RC32GF333K	AU	1
R105	RESISTOR,COMPOSITION,8.2K,10 PCT,2W	RC42GF822K	AU	1
R106	RESISTOR,COMPOSITION,220K,10 PCT,1/2W	RC20GF224K	AU	1
R107 AND R108	RESISTOR,COMPOSITION,68K,10 PCT,2W	RC42GF683K	AU	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R109 AND R110	RESISTOR,WW,30K,5 PCT,10W	10KT-30K	BN	1
R111	SAME AS R101			
R112	SAME AS R109			
R113	SAME AS R101			
R114	SAME AS R106			
R115	RESISTOR,COMPOSITION,82K,10 PCT,2W	RC42GF823K	AU	1
R116	SAME AS R104			
R117	RESISTOR,VARIABLE,COMPOSITION,50K,10 PCT,2W /POLARAD PART NO. 517853	RV4NAXSD503A	AU	1
R118	RESISTOR,FILM,0.1K,1 PCT,1W	MDF-100	DQ	1
R119	SAME AS R104			
R120	NOT USED			
R121	SAME AS R115			
R122	RESISTOR,COMPOSITION,22K,10 PCT,2W	RC42GF223K	AU	1
R123	SAME AS R117			
R124	RESISTOR,WW,25K,5 PCT,10W	10KT-25K	BN	1
R125 AND R126	RESISTOR,COMPOSITION,47 OHMS,10 PCT,2W	RC42GF470K	AU	1
R127	NOT USED			
R128 AND R129	SAME AS R102			
R130	SAME AS R124			
R131	SAME AS R102,USED ON SERIAL NOS. 635 AND UP			
R132 AND R133	SAME AS R125			
R134	SAME AS R102,USED ON SERIAL NOS. 635 AND UP			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R135	NOT USED			
R136 AND R137	SAME AS R125			
R138	NOT USED			
R139	RESISTOR,COMPOSITION,47K,10 PCT,1W	RC32GF473K	AU	1
R140 AND R141	NOT USED			
R142	RESISTOR,COMPOSITION,220K,10 PCT,2W	RC42GF224K	AU	1
R143	RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,2W /POLARAD PART NO. 517851	RV4NAXSD253A	AU	1
R144	RESISTOR,COMPOSITION,75K,5 PCT,1/2W	RC20GF753J	AU	1
R145	SAME AS R102			
R146	SAME AS R139			
R147	RESISTOR,VARIABLE,COMPOSITION,10K,10 PCT,2W /POLARAD PART NO. 517849	RV4NAXSD103A	AU	1
R148	SAME AS R139			
R149	RESISTOR,COMPOSITION,68K,10 PCT,1/2W	RC20GF683K	AU	1
R150	NOT USED			
R151	RESISTOR,COMPOSITION,120K,10 PCT,1/2W	RC20GF124K	AU	1
R152	RESISTOR,COMPOSITION,1 MEGO,10 PCT,1/2W	RC20GF105K	AU	1
R153	RESISTOR,COMPOSITION,180K,10 PCT,1/2W	RC20GF184K	AU	1
R154	RESISTOR,VARIABLE,COMPOSITION,100K,10 PCT,2W /POLARAD PART NO. 517923	RV4NAXSD104A	AU	1
R155	RESISTOR,COMPOSITION,100K,10 PCT,1/2W	RC20GF104K	AU	2
R156	SAME AS R76,USED ON SERIAL NOS. 595 THRU 634			
R157 AND R158	RESISTOR,COMPOSITION,68 OHMS,10 PCT,2W	RC42GF680K	AU	1
R159 THRU R168	NOT USED			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R169	SAME AS R102			
R170	RESISTOR,WW,1 OHM,5 PCT,5W /POLARAD PART NO. A702195	1-D-48-F-1	AZ	1
R171	RESISTOR,COMPOSITION,100K,10 PCT,1W	RC32GF104K	AU	1
R172	SAME AS R170			
R173 THRU R183	NOT USED			
R184	RESISTOR,COMPOSITION,1K,10 PCT,1/2W	RC20GF102K	AU	1
R185	NOT USED			
R186	SAME AS R102			
R187	NOT USED			
R188	SAME AS R104			
R189 THRU R193	NOT USED			
R194	RESISTOR,COMPOSITION,56K,10 PCT,2W	RC42GF563K	AU	1
R195	RESISTOR,COMPOSITION,820 OHMS,10 PCT,2W, USED ON MODEL TSA-WF ONLY	RC42GF821K	AU	1
R201	RESISTOR,COMPOSITION,4.7K,10 PCT,1/2W	RC20GF472K	AU	1
R202	RESISTOR,COMPOSITION,10K,10 PCT,1/2W	RC20GF103K	AU	1
R203	RESISTOR,COMPOSITION,2.2K,10 PCT,1W	RC32GF222K	AU	1
R204	SAME AS R101			
R205	RESISTOR,COMPOSITION,150 OHMS,10 PCT,1/2W	RC20GF151K	AU	1
R206	RESISTOR,COMPOSITION,22K,10 PCT,1/2W	RC20GF223K	AU	1
R207	SAME AS R203			
R208	RESISTOR,COMPOSITION,10 OHMS,10 PCT,1/2W	RC20GF100K	AU	1
R209	SAME AS R205			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R210	NOT USED			
R211	SAME AS R206			
R212	RESISTOR,COMPOSITION,3.3K,10 PCT,1/2W	RC20GF332K	AU	1
R213	RESISTOR,COMPOSITION,220 OHMS,10 PCT,1/2W	RC20GF221K	AU	1
R214	RESISTOR,COMPOSITION,820 OHMS,10 PCT,1/2W	RC20GF821K	AU	1
R215	SAME AS R212			
R216	SAME AS R213			
R217	SAME AS R212,USED ON SERIAL NOS. 635 AND UP			
R218	SAME AS R214			
R219	RESISTOR,COMPOSITION,56K,10 PCT,1/2W, USED ON SERIAL NOS. 595 THRU 634	RC20GF563K	AU	1
R219	RESISTOR,COMPOSITION,33K,10 PCT,1/2W, USED ON SERIAL NOS. 635 AND UP	RC20GF333K	AU	1
R220 THRU R222	NOT USED			
R223	SAME AS R202,USED ON SERIAL NOS. 595 THRU 634			
R224	SAME AS R212			
R225	SAME AS R155,USED ON SERIAL NOS. 635 AND UP			
R301	SAME AS R202			
R302	RESISTOR,COMPOSITION,3.3K,10 PCT,2W	RC42GF332K	AU	1
R303	NOT USED			
R304	RESISTOR,VARIABLE,COMPOSITION,500 OHMS, 10 PCT,2W	A128287	BE	1
R401	NOT USED			
R402	RESISTOR,WW,12K,5 PCT,5W /POLARAD PART NO.B706609	246E1235	BN	1
R403	SAME AS R117			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R404	NOT USED			
R405	RESISTOR,COMPOSITION,150K,10 PCT,1/2W	RC20GF154K	AU	1
R406	SAME AS R102,USED ON SERIAL NOS. 595 THRU 634			
R406	SAME AS R106,USED ON SERIAL NOS. 635 AND UP			
R407 THRU R410	NOT USED			
R411	RESISTOR,COMPOSITION,4.7K,10 PCT,2W	RC42GF472K	AU	1
R412	SAME AS R184			
R413	RESISTOR,COMPOSITION,27K,10 PCT,1/2W	RC20GF273K	AU	1
R414 THRU R417	NOT USED			
R418 AND R419	SAME AS R413			
R420	RESISTOR,COMPOSITION,470 OHMS,10 PCT,1W	RC32GF471K	AU	1
R421	RESISTOR,COMPOSITION,1.5K,10 PCT,1/2W	RC20GF152K	AU	1
R422	RESISTOR,COMPOSITION,51 OHMS,5 PCT,1/2W	RC20GF510J	AU	1
R423	SAME AS R101			
R424	SAME AS R184			
R425	RESISTOR,COMPOSITION,0.1K,10 PCT,2W	RC42GF101K	AU	1
R426 THRU R431	NOT USED			
R432	RESISTOR,COMPOSITION,82 OHMS,5 PCT,1/2W	RC20GF820J	AU	1
R433	NOT USED			
R434	RESISTOR,COMPOSITION,47K,10 PCT,1/2W, USED ON SERIAL NOS. 595 THRU 634	RC20GF473K	AU	1
R501	RESISTOR,COMPOSITION,12K,10 PCT,1/2W	RC20GF123K	AU	1
R502	SAME AS R102			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R503	SAME AS R151			
R504	RESISTOR,COMPOSITION,3.9 MEGO,10 PCT,1/2W	RC20GF395K	AU	1
R505	RESISTOR,VARIABLE,COMPOSITION,DUAL SECT, SECT A,1 MEGO,20 PCT,SECT B,25K,10 PCT, 2W,BOTH SECT	A138397	BE	1
R506	SAME AS R101			
R507	RESISTOR,COMPOSITION,33K,10 PCT,1/2W	RC20GF333K	AU	1
R508	RESISTOR,VARIABLE,COMPOSITION,50K,10 PCT,1/2W	B116362	BE	1
R509	RESISTOR,COMPOSITION,56K,10 PCT,1/2W	RC20GF563K	AU	1
R510	SAME AS R184			
R511	SAME AS R508			
R512	RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,1/2W	B116361	BE	1
R513	SAME AS R152			
R514	RESISTOR,COMPOSITION,270K,10 PCT,1/2W	RC20GF274K	AU	1
R515	SAME AS R512			
R516	RESISTOR,COMPOSITION,18K,10 PCT,1/2W	RC20GF183K	AU	1
R517	RESISTOR,COMPOSITION,10K,10 PCT,2W	RC42GF103K	AU	1
R518	RESISTOR,COMPOSITION,47K,10 PCT,1/2W	RC20GF473K	AU	1
R519	SAME AS R206			
R520	SAME AS R195			
R521	RESISTOR,COMPOSITION,680K,10 PCT,1/2W	RC20GF684K	AU	1
R522	SAME AS R122			
R523	SAME AS R151			
R524	SAME AS R501			
R525	SAME AS R202			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R526 AND R527	SAME AS R107			
R528	RESISTOR,VARIABLE,COMPOSITION, DUAL CONC,SECT A,50K,SECT B,1 MEGO, 20 PCT,1/2W,BOTH SECT	A133086	BE	1
R529	SAME AS R155			
R530	NOT USED			
R531	SAME AS R509			
R532	SAME AS R155			
R533	SAME AS R514			
R534	SAME AS R405			
R535	SAME AS R149			
R536	RESISTOR,VARIABLE,COMPOSITION, 1 MEGO,10 PCT,1/2W	B116364	BE	1
R537	RESISTOR,VARIABLE,COMPOSITION, 2.5 MEGO,10 PCT,1/2W	B116365	BE	1
R538	RESISTOR AND SWITCH ASSY,S502	C111709	BE	1
R539	RESISTOR,COMPOSITION,470 OHMS,10 PCT,1/2W	RC20GF471K	AU	1
R540	NOT USED			
R541	RESISTOR,WW,4K,5 PCT,10W	10KR-4K	BN	1
R542	RESISTOR,COMPOSITION,2.7K,10 PCT,2W	RC42GF272K	AU	1
R543	SAME AS R151			
R544	SAME AS R104			
R545	SAME AS R507			
R546	SAME AS R152			
R547	RESISTOR,COMPOSITION,15K,10 PCT,1/2W	RC20GF153K	AU	1
R548	RESISTOR,COMPOSITION,2.2K,10 PCT,1/2W	RC20GF222K	AU	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R549	SAME AS R508			
R550	NOT USED			
R551	SAME AS R509			
R552	RESISTOR,COMPOSITION,15K,10 PCT,1W	RC32GF153K	AU	1
R553 AND R554	SAME AS R155			
R555	RESISTOR,VARIABLE,COMPOSITION, 100K,10 PCT,1/2W	B131658	BE	1
R556	SAME AS R194			
R557	RESISTOR,COMPOSITION,820K,10 PCT,1/2W USED ON SERIAL NOS. 635 AND UP	RC20GF824K	AU	1
R557	SAME AS R434			
R558	SAME AS R405,USED ON SERIAL NOS. 595 THRU 634			
R558	SAME AS R152,USED ON SERIAL NOS. 635 AND UP			
R559	RESISTOR,COMPOSITION,33K,5 PCT,2W	RC42GF333J	AU	1
R560	NOT USED			
R561	RESISTOR,COMPOSITION,3.3K,5 PCT,1/2W, USED ON SERIAL NOS. 595 THRU 634	RC20GF332J	AU	1
R561	RESISTOR,COMPOSITION,3K,5 PCT,1/2W, USED ON SERIAL NOS. 635 AND UP	RC20GF302J	AU	1
R562	RESISTOR,COMPOSITION,91K,5 PCT,1/2W	RC20GF913J	AU	1
R563	RESISTOR,COMPOSITION,5.1K,5 PCT,1/2W	RC20GF512J	AU	1
R564	RESISTOR,COMPOSITION,180K,5 PCT,1/2W	RC20GF184J	AU	1
R565	RESISTOR,COMPOSITION,8.2K,5 PCT,1/2W	RC20GF822J	AU	1
R566	RESISTOR,COMPOSITION,330K,5 PCT,1/2W	RC20GF334J	AU	1
R567	RESISTOR,COMPOSITION,13K,5 PCT,1/2W	RC20GF133J	AU	1
R568	RESISTOR,COMPOSITION,750K,5 PCT,1/2W	RC20GF754J	AU	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R569	RESISTOR,COMPOSITION,22K,5 PCT,1/2W	RC20GF223J	AU	1
R570	NOT USED			
R571	RESISTOR,COMPOSITION,1.8 MEGO,5 PCT,1/2W	RC20GF185J	AU	1
R572	RESISTOR,COMPOSITION,20K,5 PCT,1/2W	RC20GF203J	AU	1
R573	RESISTOR,COMPOSITION,3.3 MEGO,5 PCT,1/2W	RC20GF335J	AU	1
R574	SAME AS R152			
R575 AND R576	RESISTOR,COMPOSITION,39K,10 PCT,2W	RC42GF393K	AU	1
R577 AND R578	RESISTOR,COMPOSITION,680 OHMS,10 PCT,1W	RC32GF681K	AU	1
R579	RESISTOR,COMPOSITION,15K,10 PCT,2W	RC42GF153K	AU	1
R580	NOT USED			
R581	SAME AS R514			
R582	RESISTOR,COMPOSITION,270K,5 PCT,1/2W	RC20GF274J	AU	1
R583	RESISTOR,VARIABLE,COMPOSITION, DUAL CONC,SECT A,50K,SECT B,5K, 20 PCT,1/2W,BOTH SECT	A133087	BE	1
R584	SAME AS R566			
R585	RESISTOR,VARIABLE,COMPOSITION, 250K,10 PCT,1/2W	B131659	BE	1
R586	RESISTOR,VARIABLE,COMPOSITION,DUAL SECT, SECT A,25K SECT B,1K,20 PCT,1/2W,BOTH SECT /POLARAD PART NOS.A702166	C2-35	DR	1
R587	SAME AS R555			
R588	SAME AS R201			
R589	RESISTOR,VARIABLE,COMPOSITION, 1 MEGO,10 PCT,2W	A129111	BE	1
R590 AND R591	NOT USED			
R592	SAME AS R509			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R593 AND R594	NOT USED			
R595	SAME AS R559			
R596	SAME AS R102			
R597	SAME AS R155			
R598	NOT USED			
R599	SAME AS R573			
R601 THRU R647	NOT USED			
R648	RESISTOR,COMPOSITION,330 OHMS,10 PCT,2W	RC42GF331K	AU	1
R649	RESISTOR,COMPOSITION,27K,10 PCT,2W	RC42GF273K	AU	1
R650	NOT USED			
R651	SAME AS R425			
R652	SAME AS R155			
R653	SAME AS R184			
R654 AND R655	RESISTOR,COMPOSITION,2.7 OHMS,5 PCT,1W	RC32GF2R7J	AU	1
R656 THRU R660	NOT USED			
R661	RESISTOR,COMPOSITION,50 MEGO,15 PCT,2W	BBM-508	CZ	1
R662 AND R663	NOT USED			
R664	SAME AS R405			
R665	RESISTOR,COMPOSITION,3.9 MEGO,10 PCT,1W	RC32GF395K	AU	1
R666 THRU R668	NOT USED			
R669	SAME AS R665			
R670	NOT USED			

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R671	SAME AS R665			
R672	RESISTOR,COMPOSITION,1.5 MEGO,10 PCT,1/2W	RC20GF155K	AU	1
R701 THRU R703	RESISTOR,COMPOSITION,270 OHMS,10 PCT,1/2W	RC20GF271K	AU	1
R704	SAME AS R101			
R705	RESISTOR,COMPOSITION,68 OHMS,10 PCT,1/2W	RC20GF680K	AU	1
R706	SAME AS R101			
R707	RESISTOR,COMPOSITION,560 OHMS,10 PCT,1/2W	RC20GF561K	AU	1
R708	RESISTOR,COMPOSITION,390 OHMS,10 PCT,1/2W	RC20GF391K	AU	1
R709 AND R710	SAME AS R101			
R711	SAME AS R205			
R712 THRU R716	SAME AS R101			
R717	SAME AS R708			
R718 AND R719	SAME AS R101			
R720	RESISTOR,COMPOSITION,330 OHMS,10 PCT,1/2W	RC20GF331K	AU	1
R721	SAME AS R205			
R722	SAME AS R422			
R801	SAME AS R155			
R802 AND R803	SAME AS R101			
R804	RESISTOR,VARIABLE,COMPOSITION,DUAL SECT,25K, 10 PCT,1/2W,BOTH SECT/POLARAD PART NO, A706986	KR8822	DR	1
R805 AND R806	SAME AS R101			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R807	NOT USED			
R808	SAME AS R701			
R809	SAME AS R202			
R810	SAME AS R101			
R811	NOT USED			
R812 AND R813	SAME AS R101•USED ON SERIAL NOS. 595 THRU 634			1
R812 AND R813	RESISTOR•COMPOSITION•33 OHMS•5 PCT•1/2W• USED ON SERIAL NOS. 635 AND UP	RC20GF330J	AU	1
S1 THRU S74	NOT USED			
S75	SWITCH•TOGGLE•DPDT	8373K8	CD	1
S76	SWITCH•ROTARY•SINGLE POLE•4 POSITIONS /POLARAD PART NO. A137889	PA-2001	P	1
S101 THRU S103	NOT USED			
S104	SWITCH•ROTARY•2 POLES•5 POSITION /POLARAD PART NO. A137213	MS20-1-6DT	AL	1
S301	SWITCH•SENSITIVE•SPDT	AN3234-1	A	1
S501	SWITCH•ROTARY•2 POLES•3 POSITION /POLARAD PART NO. B707026	PA024-4349	P	1
T101	TRANSFORMER•POWER•KLYSTRON	BP22134	BE	1
T102	TRANSFORMER•POWER	B129121	BE	1
T103	TRANSFORMER•POWER	C144164	BE	1
T201	TRANSFORMER•RF•VARIABLE	A140024	BE	1
T202 THRU T218	NOT USED			
T219	TRANSFORMER•RF•USED ON SERIAL NOS. 595 THRU 634	B127649	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
T401	TRANSFORMER,RF	A127657	BE	1
T601 AND T602	NOT USED			
T603	TRANSFORMER,POWER,CRT SUPPLY	AP21385	BE	1
T801	TRANSFORMER,RF,VARIABLE	B141447	BE	1
T802	TRANSFORMER,RF,VARIABLE	B142122	BE	1
V1 THRU V74	NOT USED			
V75	ELECTRON TUBE,CRT	5ADP7	CK	2
V101 AND V102	ELECTRON TUBE	5R4GY	CK	4
V103 AND V104	ELECTRON TUBE	807	CK	4
V105	ELECTRON TUBE	12AX7	CK	8
V106 THRU V110	ELECTRON TUBE	0A2	CK	10
V111	ELECTRON TUBE	6080	CK	6
V112	ELECTRON TUBE	5881	CK	2
V113 AND V114	SAME AS V111			
V115 THRU V117	SAME AS V105			
V118	ELECTRON TUBE	5651	CK	2
V201	ELECTRON TUBE	6AK5	CK	4
V202 AND V203	ELECTRON TUBE	6BE6	CK	4
V204 AND V205	ELECTRON TUBE	6AH6	CK	8
V301	ELECTRON TUBE	5718	AA	8

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
V403	ELECTRON TUBE	6005	AU	2
V401 AND V402	NOT USED			
V404	NOT USED			
V405 AND V406	SAME AS V301			
V407	NOT USED			
V408	SAME AS V201			
V409	SAME AS V301			
V501	ELECTRON TUBE	6AS6	CK	2
V502	ELECTRON TUBE	12AT7	CK	4
V503 THRU V505	ELECTRON TUBE	12AU7	CK	6
V506 AND V507	ELECTRON TUBE	6AN8	CK	4
V508 AND V509	SAME AS V204			
V601 THRU V615	NOT USED			
V616	ELECTRON TUBE	6AR6	CK	2
V617 AND V618	ELECTRON TUBE	1Z2	CK	4
V701 THRU V704	ELECTRON TUBE	6922	DN	8
V801	SAME AS V502			
V802	ELECTRON TUBE	6AG5	CK	2
W80	CABLE ASSY	A135336	BE	1
W81 THRU W84	NOT USED			
W85	CABLE ASSY	A134776	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
W86	CABLE ASSY	A134778	BE	1
W87	CABLE ASSY	A137211	BE	1
W88	CABLE ASSY	A135337	BE	1
W89	CABLE ASSY	A135338	BE	1
W90	CABLE ASSY	A137212	BE	1
W91 AND W92	CABLE ASSY	A141444	BE	1
W201	CABLE ASSY.PART OF P203	A137228	BE	1
W202	NOT USED			
W203	CABLE ASSY	A132283	BE	1
W301	CABLE ASSY	A126279	BE	1
W302	CABLE ASSY	A126278	BE	1
W303	CABLE ASSY	A135347	BE	1
W401	CABLE ASSY	A133099	BE	1
W601	CABLE ASSY	A134769	BE	1
XDS1 THRU XDS75	NOT USED			
XDS76	LAMPHOLDER.BAYONET SOCKET	101-3830-971	V	1
XDS77 THRU XDS80	LAMPHOLDER.BAYONET SOCKET /POLARAD PART NO. AP17672	7-06	V	1
XF101 AND XF102	FUSEHOLDER	341001	AP	1
XF103 AND XF104	FUSEHOLDER/POLARAD PART NO. B702401	357001	AP	1
Y201	CRYSTAL.QUARTZ.29MC.0.005 PCT	CR-23/U-29MC	AU	1
Y801 AND Y802	CRYSTAL.QUARTZ.6MC.0.005 PCT	B706956	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
	SUPPLIED ACCESSORIES			
A1	ACCESSORY KIT	A140033	BE	1
A2	WRENCH KIT	A25109	BE	1
CP1	CONNECTOR•ADAPTER•3 CONTACTS WITH GROUNDING WIRE /POLARAD PART NO• A131966	228	FS	1
MP1	FILTER•CRT•AMBER	B27336-1	BE	1
W1 THRU W70	NOT USED			
W71	CABLE ASSY•POWER ELECTRICAL	B111144	BE	1
W71A	CABLE ASSY•PART OF W71	B145871	BE	1
W72	CABLE ASSY	BP12551	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
	MODEL STU-1WA TUNING UNIT			
AT601	ATTENUATOR,3DB/POLARAD PART NO. AK5530	HFA-50	DJ	1
AT602	ATTENUATOR ASSY	A26581	BE	1
AT603	ATTENUATOR ASSY,VARIABLE	CP21383	BE	1
A501	NARROW BAND FILTER ASSY	C144772	BE	1
A601	CONNECTOR AND ATTENUATOR ASSY,PART OF AT603	AP23841	BE	1
A602	PRE-AMPLIFIER ASSY	D144765	BE	1
A603	OSCILLATOR AND ATTENUATOR ASSY	DP21538	BE	1
A604	LOW PASS FILTER ASSY	B24000	BE	1
A605	OSCILLATOR PLATE ASSY	CP22194	BE	1
CP601	ADAPTER,TEE/POLARAD PART NO. AK5528	UG-28A/U	AU	1
CP602	ADAPTER,REDUCING,PART OF W606	UG-175/U	AU	1
CP603	ADAPTER,THREADED,PART OF AT602	A26648	BE	1
CR601	SEMICONDUCTOR DEVICE,DIODE,MICROWAVE	1N21C	CJ	5
CR602	SEMICONDUCTOR DEVICE,DIODE,ZENER /POLARAD PART NO. A702520	1.5M9.1Z-10	FK	5
CR603 AND CR604	NOT USED			
CR605 AND CR606	SEMICONDUCTOR DEVICE,DIODE/POLARAD PART NO. B707117/USED ON MODEL STU-1WAF ONLY	CER-71	GJ	4
C501	CAPACITOR,MICA,39UUF,5 PCT,500WVDC	CM15C390J	AU	1
C502 THRU C505	CAPACITOR,VARIABLE,CERAMIC,2.0-12UUF,500WVDC /POLARAD PART NO. A701519	PCST-50	CH	1
C601 THRU C603	NOT USED			
C604	CAPACITOR,CERAMIC,68UUF,10 PCT,500WVDC	NPO-301	Y	1
C605	NOT USED			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C606	CAPACITOR,CERAMIC,1UUF,10 PCT,500WVDC	GA-1	CL	1
C607	CAPACITOR,MICA,15UUF,10 PCT,500WVDC	M-24	BL	1
C608	CAPACITOR,CERAMIC,FEED-THRU,1000UUF, 20 PCT,500WVDC/POLARAD PART NO. A506409	327-102	Y	1
C609	CAPACITOR,MICA,500UUF,10 PCT,500WVDC	370FC-501K	Y	1
C610 AND C611	NOT USED			
C612	SAME AS C608			
C613 THRU C626	NOT USED			
C627	CAPACITOR,VARIABLE,C/O MP601 AND MP602, NON-REPLACEABLE PART OF A605			
C628 THRU C631	NOT USED			
C632 AND C633	CAPACITOR,CERAMIC,25UUF,10 PCT,500WVDC	NPO-308	Y	1
C634	SAME AS C604			
C635 AND C636	NOT USED			
C637	CAPACITOR,CERAMIC,1.5UUF,5 PCT,500WVDC	GA-1.5	CL	1
C638 THRU C650	NOT USED			
C651	CAPACITOR,CERAMIC,1000UUF,GMV,500WVDC /POLARAD PART NO. B706421	SB4A-102W	D	1
C652	CAPACITOR,CERAMIC,470UUF,10 PCT,1000WVDC /POLARAD PART NO. A702150	DD-471	P	1
C653 THRU C655	SAME AS C651			
C656	SAME AS C502			
C657	SAME AS C651			
C658	SAME AS C502			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C659 THRU C662	NOT USED			
C663 AND C664	SAME AS C502			
C665	CAPACITOR,CERAMIC,10UUF,0.25UUF,TOL,500WVDC	CC20CH100C	AU	1
C666 AND C667	SAME AS C502			
C668	SAME AS C665			
C669 THRU C672	NOT USED			
C673	SAME AS C502			
C674	SAME AS C652			
DS601 AND DS602	LAMP,INCANDESCENT,6-8V,BAYONET BASE /POLARAD PART NO. 005237	47	CK	2
FL601 AND FL602	FILTER,RF,2500UUF,20 PCT,500WVDC /POLARAD PART NO. A700354	FIB-A	D	1
FL603 THRU FL651	NOT USED			
FL652	FILTER,RF,LOW PASS,1000UUF,20 PCT,200WVDC /POLARAD PART NO. A701510	SMFB-2	D	1
H601	KNOB,UNI-DIAL TUNING	A26804	BE	1
H602	KNOB/POLARAD PART NO. A517213	225-3-2	BH	1
J601	CONNECTOR,RECEPTACLE,FEMALE,N TYPE, PART OF W601/POLARAD PART NO. AK5401	MSC2016	AR	1
J602	CONNECTOR,RECEPTACLE,FEMALE,N TYPE /POLARAD PART NO. A109999	CBYY8263	DH	1
J603	CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE, NON-REPLACEABLE PART OF K602			
J604	CONNECTOR,RECEPTACLE,MALE,18 PINS,WITH HOOD	SA18P-H	CC	1
J605	CONNECTOR,RECEPTACLE,BNC TYPE,RT ANGLE	UG-535/U	AU	1
J606	CONNECTOR,PLUG,FEMALE,BNC TYPE,PART OF W604	UG-913/U	AU	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
J607	NOT USED			
J608	CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE	UG-625A/U	AU	1
J609	CONNECTOR,RECEPTACLE,FEMALE,UHF TYPE, NON-REPLACEABLE PART OF XCR601	UG-88C/U		
J610 THRU J612	NOT USED			
J613 THRU J615	CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE, NON-REPLACEABLE PART OF K601			
J616 AND J617	SAME AS J608			
J618 AND J619	SAME AS J603			
J620	NOT USED			
J621	CONNECTOR,RECEPTACLE,FEMALE,5 PINS, WITH HOOD/POLARAD PART NO. C509729	M5S-LRN	CC	1
J622	CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE, PART OF A602/POLARAD PART NO. A701331	UG-290A/U	AU	1
J623	CONNECTOR,PLUG,FEMALE,N TYPE,PART OF AT602 /POLARAD PART NO. A26580	A26580	BE	1
J624	CONNECTOR,PLUG,MALE,N TYPE /POLARAD PART NO. AK5290	MS2012	AR	1
J625	CONNECTOR,PLUG,FEMALE,N TYPE,PART OF AT602 /POLARAD PART NO. A127603	UG-21B/U	AU	1
J626	CONNECTOR,PLUG,MALE,N TYPE, NON-REPLACEABLE PART OF XCR601			
J627 THRU J650	NOT USED			
J651	CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE,RT ANGLE	UG-1098/U	AU	1
K601 AND K602	RELAY,ARMATURE,SPDT,115VAC,60CPS /POLARAD PART NO. B137913	316-010102-8	DW	1
L501	COIL,RF,0.029UH	B107164	BE	1
L502	COIL,RF,0.147UH	B107466	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
L503	COIL,RF,0.09UH	A107159	BE	1
L504	COIL,RF,0.096UH	B107160	BE	1
L505	COIL,RF,0.071UH	A107161	BE	1
L506	COIL,RF,0.146UH	B107162	BE	1
L507	COIL,RF,0.079UH	A107163	BE	1
L508	SAME AS L502			
L601	COIL,RF,NON-REPLACEABLE PART OF W601			
L602	COIL,RF,NON-REPLACEABLE PART OF A601			
L603 THRU L605	NOT USED			
L606	COIL,RF	A24132	BE	1
L607	COIL,RF,0.8UH	AP21094	BE	1
L608	COIL,RF,4.5UH	A24893	BE	1
L609 THRU L630	NOT USED			
L631 AND L632	COIL,RF,VARIABLE	A24176	BE	1
L633 THRU L650	NOT USED			
L651 THRU L653	COIL,RF,4.7UH/POLARAD PART NO. A702559	10102-24	EK	1
L654	COIL,RF,VARIABLE	B142203	BE	1
L656	COIL,RF,0.08UH	B107356	BE	1
L657	COIL,RF,0.146UH	A107357	BE	1
L658	COIL,RF	A142519	BE	1
L659	COIL,RF,0.06UH	B107359	BE	1
L660	NOT USED			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
L661	COIL,RF,0.1345UH	A107360	BE	1
L662 THRU L664	NOT USED			
L665	COIL,RF	A142520	BE	1
L666	COIL,RF,0.08UH	B107365	BE	1
MP601	INNER RING,PART OF C627	AP23930-1	BE	1
MP602	OUTER RING,PART OF C627	AP23930-2	BE	1
P601	NOT USED			
P602	CONNECTOR,PLUG,MALE,N TYPE,PART OF W603	UG-21B/U	AU	1
P603	CONNECTOR,PLUG,MALE,BNC TYPE	UG-88C/U	AU	1
P604	CONNECTOR,PLUG,MALE,18 PINS,WITH HOOD /POLARAD PART NO. B537502	SA18P-H	CC	1
P605	CONNECTOR,PLUG,MALE,BNC TYPE, NON-REPLACEABLE PART OF AT601			
P606	CONNECTOR,PLUG,MALE,BNC TYPE, NON-REPLACEABLE PART OF AT601			
P607	SAME AS P603			
P608	CONNECTOR,PLUG,MALE,BNC TYPE	UG-88/U	AU	1
P609	CONNECTOR,PLUG,MALE,UHF TYPE /POLARAD PART NO. AK5532	83-59	F	1
P610 THRU P612	NOT USED			
P613 THRU P619	SAME AS P603			
P620	NOT USED			
P621	CONNECTOR,PLUG,MALE,5 PINS,WITH HOOD,H19C /POLARAD PART NO. C509706	M5P-LS	CC	1
P622	SAME AS P608			
P623	SAME AS P602			

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
P624 THRU P626	CONNECTOR,PLUG,MALE,N TYPE, NON-REPLACEABLE PART OF CP601			
P627 THRU P650	NOT USED			
P651	SAME AS P603			
Q601 THRU Q650	NOT USED			
Q651	TRANSISTOR,PNP TYPE /POLARAD PART NO. A702519	PADT-30	DN	1
R601	RESISTOR,COMPOSITION,47 OHMS,10 PCT,1/2W, PART OF W601			
R602	RESISTOR,COMPOSITION,47 OHMS,10 PCT,1/2W, NON-REPLACEABLE PART OF A601			
R603	RESISTOR,COMPOSITION,18 OHMS,5 PCT,1/2W, NON-REPLACEABLE PART OF AT602			
R604 AND R605	RESISTOR,COMPOSITION,300 OHMS,5 PCT,1/2W, NON-REPLACEABLE PART OF AT602			
R606	RESISTOR,COMPOSITION,22K,10 PCT,2W	RC42GF223K	AU	1
R607 AND R608	NOT USED			
R609	SAME AS R606			
R610	NOT USED			
R611	RESISTOR,COMPOSITION,240 OHMS,5 PCT,1/2W	RC20GF241J	AU	1
R612	RESISTOR,COMPOSITION,2.2K,10 PCT,1/2W	RC20GF222K	AU	1
R613	RESISTOR COMPOSITION,1.5K,10 PCT,2W	RC42GF152K	AU	1
R614 THRU R619	NOT USED			
R620	RESISTOR,COMPOSITION,150 OHMS,10 PCT,1/2W	RC20GF151K	AU	1
R621 THRU R629	NOT USED			
R630	RESISTOR,WW,500 OHMS,5 PCT,5W, USED ON MODEL STU-1WAF ONLY	57E5015T8	BN	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R631 THRU R650	NOT USED			
R651	RESISTOR,COMPOSITION,5.6K,5 PCT,1/4W	RC07GF562J	AU	1
R652	RESISTOR,COMPOSITION,3.6K,5 PCT,1/4W	RC07GF362J	AU	1
R653	RESISTOR,COMPOSITION,560 OHMS,5 PCT,1/4W	RC07GF561J	AU	1
R654	RESISTOR,COMPOSITION,360 OHMS,5 PCT,1/4W	RC07GF361J	AU	1
R655 THRU R661	NOT USED			
R662	RESISTOR,COMPOSITION,300 OHMS,5 PCT,1/4W	RC07GF301J	AU	1
R663	RESISTOR,COMPOSITION,18 OHMS,5 PCT,1/4W	RC07GF180J	AU	1
R664	SAME AS R662			
R665 THRU R671	NOT USED			
R672	RESISTOR,COMPOSITION,430 OHMS,5 PCT,1/4W	RC07GF431J	AU	1
R673	RESISTOR,COMPOSITION,12 OHMS,5 PCT,1/4W	RC07GF120J	AU	1
R674	SAME AS R672			
R675	NOT USED			
R676	RESISTOR,COMPOSITION,2.2K,10 PCT,1/2W	RC20GF222K	AU	1
R677	RESISTOR,COMPOSITION,22 OHMS,5 PCT,1/4W	RC07GF220J	AU	1
R678 AND R679	RESISTOR,COMPOSITION,910 OHMS,5 PCT,1/4W	RC07GF911J	AU	1
S601	SWITCH,PUSH,DOUBLE POLE /POLARAD PART NO. AP20438	D8-4	GB	1
T601 THRU T651	NOT USED			
T652	TRANSFORMER,POWER	B142517	BE	1
V601	ELECTRON TUBE	6AF4A	CK	2
W601	PROBE AND CABLE ASSY,PART OF AT603	BP21387	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
W602	CABLE ASSY	A27074	BE	1
W603	CABLE ASSY•PATCH	A24845	BE	1
W604	CABLE ASSY	A26610	BE	1
W605	CABLE ASSY	A27075	BE	1
W606	CABLE ASSY	A26609	BE	1
W607	CABLE ASSY	B144586	BE	1
W608	NOT USED			
W609	CABLE ASSY	B144592	BE	1
W610	SAME AS W607			
W611	CABLE ASSY	B144587	BE	1
W612	CABLE ASSY	B144588	BE	1
W613	CABLE ASSY	B144589	BE	1
XCR601	HOLDER•CRYSTAL/POLARAD PART NO• A702286	KN-81-02	GN	1
XDS601 AND XDS602	LAMPHOLDER/POLARAD PART NO• 005246	708	V	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
	MODEL STU-2WA TUNING UNIT			
A801	MIXER AND ATTENUATOR ASSY	CP22569	BE	1
A802	CONNECTOR,TEE,N TYPE,PART OF A801	AP22571	BE	1
CP801	CONNECTOR,TEE,N TYPE	AP22351	BE	1
CR801	SEMICONDUCTOR DEVICE,DIODE,MICROWAVE	1N23C	CJ	5
C801	CAPACITOR PAPER,0.1UF,20 PCT,10000WVDC	CP61B1DG104M	AU	1
C1501	CAPACITOR,VARIABLE,CERAMIC,2-12UUF,500WVDC /POLARAD PART NO. A701519	PCST-50	CH	1
C1502	CAPACITOR,MICA,500UUF,2 PCT,300WVDC /POLARAD PART NO. A702433	370FA-501G	Y	1
DS801 AND DS802	LAMP,INCANDESCANT,6-8 VOLTS,BAYONET BASE /POLARAD PART NO. 005237	47	CK	2
H801	KNOB,UNI-DIAL TUNING	A26804	BE	1
H802	KNOB/POLARAD PART NO. A517213	225-3-2	BH	1
J801 AND J802	CONNECTOR,RECEPTACLE,FEMALE,N TYPE /POLARAD PART NO. AK5401	MSC2016	AR	1
J803	CONNECTOR,RECEPTACLE,MALE,18 PINS /POLARAD PART NO. B537502	SA18P	CC	1
J804	NOT USED			
J805	JACK,TIP,BLUE/POLARAD PART NO. A541402	110BCS	C	1
J806	JACK,TIP,RED/POLARAD PART NO. A541401	110BCS	C	1
J807 THRU J809	CONNECTOR,RECEPTACLE,FEMALE,N TYPE NON-REPLACEABLE PART OF A802			
J1501	CONNECTOR,RECEPTACLE,FEMALE,N TYPE /POLARAD PART NO. A702498	01120	EA	1
J1502	CONNECTOR,RECEPTACLE,FEMALE,BNC TYPE	UG-290/U	AU	1
L1501 AND L1502	COIL,RF	A145010	BE	1
P801 THRU P806	NOT USED			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
P807	CONNECTOR,PLUG,MALE,BNC TYPE	UG-88/U	AU	1
P808 AND P809	CONNECTOR,PLUG,FEMALE,N TYPE /POLARAD PART NO. A529000	MS-2012	AT	1
P1501	NOT USED			
P1502	SAME AS P807			
R801	RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,2W /POLARAD PART NO. 517851	RV4NAXSD253A	AU	1
R802 AND R803	RESISTOR,VARIABLE,COMPOSITION,50K,10 PCT,2W /POLARAD PART NO. 517853	RV4NAXSD503A	AU	1
R804 THRU R807	NOT USED			
R808	RESISTOR,COMPOSITION,6.8K,10 PCT,2W	RC42GF682K	AU	1
R809	SAME AS R802			
R810	RESISTOR,VARIABLE,COMPOSITION,100K,10 PCT,2W /POLARAD PART NO. 517923	RV4NAXSD104A	AU	1
R811 AND R812	NOT USED			
R813	RESISTOR,COMPOSITION,10K,10 PCT,2W	RC42GF103K	AU	1
R814	NOT USED			
R815	RESISTOR,COMPOSITION,47K,10 PCT,2W	RC42GF473K	AU	1
R816 THRU R819	NOT USED			
R820	SAME AS R815			
R821	RESISTOR,COMPOSITION,120K,10 PCT,2W	RC42GF124K	AU	1
R822	RESISTOR,COMPOSITION,82K,10 PCT,2W	RC42GF823K	AU	1
R823	RESISTOR,COMPOSITION,100K,10 PCT,1W	RC32GF104K	AU	1
R824	RESISTOR,COMPOSITION,270K,10 PCT,1W	RC32GF274K	AU	1
R825	RESISTOR,VARIABLE,WW,100K,5 PCT,12W	BK5413	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R826	RESISTOR,COMPOSITION,8.2K,10 PCT,2W	RC42GF822K	AU	1
R827 THRU R838	NOT USED			
R839	RESISTOR,FILM,50 OHMS,10 PCT,1/2W NON-REPLACEABLE PART OF W802 /POLARAD PART NO. A544104			
R840	RESISTOR,FILM,50 OHMS,10 PCT,1/2W, NON-REPLACEABLE PART OF W804 /POLARAD PART NO. A544104			
S801	SWITCH,SENSITIVE,DPST /POLARAD PART NO. AK5412	BZ3YW22T	AX	1
V801	ELECTRON TUBE,KLYSTRON /POLARAD PART NO. AK50046	6BM6 OR 5837	CS	2
V802	ELECTRON TUBE	6X4	CK	2
W801	CABLE ASSY	AP22504-3	BE	1
W802	CABLE AND PROBE ASSY	B22572	BE	1
W803	CABLE ASSY	A144144	BE	1
W804	CABLE AND PROBE ASSY	BP22502	BE	1
XCR801	HOLDER,CRYSTAL	A25270	BE	1
XDS801 AND XDS802	LAMPHOLDER,BAYONET SOCKET /POLARAD PART NO. 005246	708	V	1
Y801	OSCILLATOR ASSY LESS V801	CP20566	BE	1
Z1501	MIXER MATCHING BOX ASSY	C139405	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
	MODEL STU-3WA TUNING UNIT			
AT901	ATTENUATOR ASSY	CP23961	BE	1
A901	MIXER ASSY	D145672	BE	1
B901	BLOWER ASSY,CENTRIFUGAL,115VAC,50-60CPS, USED ON STU-3W ONLY	CP20756	BE	1
B901A	MOTOR,BLOWER,CENTRIFUGAL,115VAC,50-60CPS, PART OF B901/POLARAD PART NO. BP21123	50745-6E	EV	1
B901B	FILTER,AIR CONDITIONING,PART OF B901	BP10517	BE	1
B902	BLOWER ASSY,CENTRIFUGAL,115VAC,50-1000CPS, USED ON STU-3WAF ONLY	C125443	BE	1
B902A	MOTOR,BLOWER,CENTRIFUGAL,115VAC,50-1000CPS, PART OF B902	B124348	BE	1
B902B	FILTER,AIR CONDITIONING,PART OF B902	A129399	BE	1
CP901	ADAPTER ASSY,N TYPE	C119529	BE	1
CP902	ADAPTER ASSY	C20947	BE	1
CP903	ADAPTER ASSY	BP24550	BE	1
CP904	ADAPTER,CONNECTOR,PART OF W906	BP24029	BE	1
CR901	SEMICONDUCTOR DEVICE,DIODE,MICROWAVE	1N78	CJ	5
C901	CAPACITOR,PAPER,0.1UF,20 PCT,1000WVDC	CP61B1DG104M	AU	1
C1002	CAPACITOR,PAPER,0.5UF,10PCT,600WVDC, PART OF B902	CP54B1EF504K	AU	1
DS901 AND DS902	LAMP,INCANDESCANT,6-8V,BAYONET BASE /POLARAD PART NO. 005237	47	CK	2
H901	KNOB, UNI-DIAL TUNING	A26804	BE	1
H902	KNOB/POLARAD PART NO. AP22082	125-2-2	H	1
J901 AND J902	CONNECTOR,RECEPTACLE,FEMALE,N TYPE /POLARAD PART NO. AK5401	MSC2016	AR	1
J904	CONNECTOR,PLUG,MALE,18 PINS /POLARAD PART NO. B537502	SA18P	CC	

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
J905	JACK,TIP,BLUE/POLARAD PART NO. A541402	110BCS	C	1
J906	JACK,TIP,RED/POLARAD PART NO. A541401	110BCS	C	1
J907	CONNECTOR ASSY,PART OF AT901	AP23978	BE	1
P901 AND P902	CONNECTOR,PLUG,MALE,N TYPE	UG-21B/U	AU	1
P903	CONNECTOR,PLUG,MALE,BNC TYPE	UG-88/U	AU	1
P904 THRU P906	NOT USED			
P907	CONNECTOR,PLUG,MALE,N TYPE /POLARAD PART NO. A529000	MS2012	AR	1
P1501	NOT USED			
R901	RESISTOR,FILM,MICROWAVE,50 OHMS,10 PCT,1/2W, NON-REPLACEABLE PART OF W904 /POLARAD PART NO. A544104			
R902	RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,2W /POLARAD PART NO. 517851	RV4NAXSD253A	AU	1
R903 AND R904	RESISTOR,COMPOSITION,10K,10 PCT,1W /POLARAD PART NO. 519219	RC32GF103K	AU	1
R905	RESISTOR,VARIABLE,COMPOSITION,50K,10 PCT,2W /POLARAD PART NO. 517853	RV4NAXSD503A	AU	1
R906	RESISTOR,FILM,MICROWAVE,50 OHMS,10 PCT,1/2W, NON-REPLACEABLE PART OF W905 /POLARAD PART NO. A544104			
R907 THRU R914	NOT USED			
R915	SAME AS R905			
R916	SAME AS R902			
R917	RESISTOR,COMPOSITION,47K,10 PCT,2W /POLARAD PART NO. 518623	RC42GF473K	AU	1
R918	NOT USED			
R919	SAME AS R905			
R920	RESISTOR,VARIABLE,WW,100K,1 PCT,12W, TAP A,80K,TAP B,60K,TAP C,40K,TAP D,20K /POLARAD PART NO. 005033	RVLL-3-12-S73	DL	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R921	RESISTOR,COMPOSITION,270K,10 PCT,1W	RC32GF274K	AU	1
R922	RESISTOR,COMPOSITION,100K,10 PCT,1W /POLARAD PART NO. 519225	RC32GF104K	AU	1
S901	SWITCH,SENSITIVE,DPST,115 VAC /POLARAD PART NO. AK5412	BZ3YW22T	AM	1
V901	ELECTRON TUBE,KLYSTRON /POLARAD PART NO. BK5014	5721	BH	2
V902	ELECTRON TUBE	6X4	CK	2
W901	NOT USED			
W902	CABLE ASSY	AP22504-2	BE	1
W903	CABLE ASSY,PATCH	A24845	BE	1
W904	CABLE AND PROBE ASSY,PART OF A901	BP22631	BE	1
W905	CABLE AND PROBE ASSY,PART OF AT901	BP21084	BE	1
W906	CABLE ASSY,RF,PART OF A901	B145673	BE	1
XDS901 AND XDS902	LAMPHOLDER,BAYONET SOCKET /POLARAD PART NO. 005246	708	V	1
Y901	OSCILLATOR ASSY,LESS V901	CP20512	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
	MODEL STU-4WA TUNING UNIT			
A1001	FREQUENCY CONVERTER ASSY	D145675	BE	1
A1002	MIXER ASSY	C145677	BE	1
B1001	BLOWER ASSY,CENTRUFUGAL,115VAC,50-60CPS	CP20756	BE	1
B1001A	MOTOR,BLOWER,SYNCHRONOUS,115VAC,50-60CPS, PART OF B1001/POLARAD PART NO. BP21123	50745-6E	EV	1
B1001B	FILTER,AIR CONDITIONING,PART OF B1001 /POLARAD PART NO. BP10517	BP10517	BE	1
B1002	BLOWER ASSY,CENTRIFUGAL,115VAC,50-1000CPS, USED ON STU-4WAF ONLY	C125443	BE	1
B1002A	MOTOR,BLOWER,CENTRIFUGAL,115VAC,50-1000CPS, PART OF B1002	B124348	BE	1
B1002B	FILTER,AIR CONDITIONING,PART OF B1002	A129399	BE	1
CP1001	CONNECTOR,ADAPTER ASSY	B146205	BE	1
CR1001	SEMICONDUCTOR DEVICE,DIODE,SILICON	1N26	CK	5
C1001	CAPACITOR,PAPER,0.1UF,20 PCT,1000WVDC	CP61B1DG104M	AU	1
C1002	CAPACITOR,PAPER,0.5UF,10 PCT,600WVDC, PART OF B1002	CP54B1EF504K	AU	1
DS1001 AND DS1002	LAMP,INCANDESCENT,6-8V,BAYONET BASE /POLARAD PART NO. 005237	47	CK	2
H1001	KNOB,UNI-DIAL TUNING	A26804	BE	1
J1001 THRU J1003	NOT USED			
J1004	CONNECTOR,RECEPTACLE,MALE,18 PINS, /POLARAD PART NO. 516013	SA18P	CC	1
J1005	JACK,TIP,BLUE/POLARAD PART NO. A541402	110BCS	C	1
J1006	JACK,TIP,RED/POLARAD PART NO. A541401	110BCS	C	1
MP1001	KLYSTRON COVER AND SOCKET	BK50148	BE	1
P1001 AND P1002	NOT USED			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
P1003	CONNECTOR,PLUG,MALE,BNC TYPE	UG-88/U	AU	1
R1001	RESISTOR,FILM,MICROWAVE,50 OHMS,10 PCT,1/2W, NON-REPLACEABLE PART OF W1001 /POLARAD PART NO. A544104			
R1002	RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,2W /POLARAD PART NO. 517851	RV4NAXSD253A	AU	1
R1003 AND R1004	RESISTOR,COMPOSITION,10K,10 PCT,1W	RC32GF103K	AU	1
R1005	RESISTOR,VARIABLE,COMPOSITION,100K,10 PCT,2W /POLARAD PART NO. 517923	RV4NAXSD104A	AU	1
R1006 THRU R1014	NOT USED			
R1015	SAME AS R1005			
R1016	RESISTOR,VARIABLE,COMPOSITION,250K,10 PCT,2W /POLARAD PART NO. 517925	RV4NAXSD254A	AU	1
R1017	RESISTOR,COMPOSITION,47K,10 PCT,2W	RC42GF473K	AU	1
R1018	NOT USED			
R1019	SAME AS R1005			
R1020	RESISTOR,VARIABLE,WW,100K,1 PCT,12W, TAP A,80K,TAP B,60K,TAP C,40K,TAP D,20K /POLARAD PART NO. 005033	RVLL-3-12-S73	DL	1
R1021	RESISTOR,COMPOSITION,270K,10 PCT,1W	RC32GF274K	AU	1
R1022	RESISTOR,COMPOSITION,100K,10 PCT,1W	RC32GF104K	AU	1
S1001	SWITCH,SENSITIVE,SPDT/POLARAD PART NO. AK5412	BZ3YW22T	AX	1
TB1001	TERMINAL BOARD ASSY	CP23615	BE	1
V1001	ELECTRON TUBE,KLYSTRON /POLARAD PART NO. BK5014	5721	BH	1
V1002	ELECTRON TUBE	6X4	CK	1
W1001	PROBE AND CABLE ASSY,PART OF A1002	BP15655	BE	1
W1002	WAVEGUIDE ADAPTER ASSY	BP22330	BE	1
W1003	WAVEGUIDE ADAPTER ASSY	BP22331	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
W1004	CABLE ASSY	B145678	BE	1
XDS1001 AND XDS1002	LAMPHOLDER,BAYONET SOCKET /POLARAD PART NO. 005246	7-08	V	1
Y1001	OSCILLATOR ASSY LESS V1001	CP20512	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
	MODEL STU-5WA TUNING UNIT			
A1101	FREQUENCY CONVERTER ASSY	D146347	BE	1
A1102	MIXER ASSY	C146349	BE	1
B1101	BLOWER ASSY,CENTRIFUGAL,115VAC,50-60CPS	CP20756	BE	1
B1101A	MOTOR,BLOWER,CENTRIFUGAL,115VAC,50-60CPS, PART OF B1101/POLARAD PART NO. BP21123	50745-6E	EV	1
B1101B	FILTER AIR CONDITIONING,PART OF B1101	BP10517	BE	1
B1102	BLOWER ASSY,CENTRIFUGAL,115VAC,50-1000CPS, USED ON STU-5WAF ONLY	C125443	BE	1
B1102A	MOTOR,BLOWER,CENTRIFUGAL,115VAC,50-1000CPS, PART OF B1102	B124348	BE	1
B1102B	FILTER,AIR CONDITIONING,PART OF B1102	A129399	BE	1
CP1101	CONNECTOR,ADAPTER ASSY	B146206	BE	1
CR1101	SEMICONDUCTOR DEVICE,DIODE,MICROWAVE	1N53	CJ	5
C1101	CAPACITOR,PAPER,0.1UF,20 PCT,1000WVDC	CP61B1DG104M	AU	1
C1102	CAPACITOR,PAPER,0.5UF,10 PCT,600WVDC, PART OF B1102	CP54B1EF504K	AU	1
DS1101 AND DS1102	LAMP,INCANDESCENT,6-8V,BAYONET BASE /POLARAD PART NO. 005237	47	CK	2
H1101	KNOB,UNI-DIAL TUNING	A26804	BE	1
J1101 THRU J1103	NOT USED			
J1104	CONNECTOR,RECEPTACLE,MALE,18 PINS /POLARAD PART NO. 516013	SA18P	CC	1
J1105	JACK,TIP,BLUE/POLARAD PART NO. A541402	110BCS	C	1
J1106	JACK,TIP,RED/POLARAD PART NO. A541402	110BCS	C	1
MP1101	KLYSTRON COVER AND SOCKET	BK50148	BE	
P1101 AND P1102	NOT USED			

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
P1103	CONNECTOR,PLUG,MALE,BNC TYPE	UG-88/U	AU	1
R1101	RESISTOR,MICROWAVE,50 OHMS,10 PCT,1/2W NON-REPLACEABLE PART OF W1101 /POLARAD PART NO. A544104			
R1102	RESISTOR,VARIABLE,COMPOSITION,25K,10 PCT,2W /POLARAD PART NO. 517851	RV4NAXSD253A	AU	1
R1103 AND R1104	RESISTOR,COMPOSITION,10K,10 PCT,1W	RC32GF103K	AU	1
R1105	RESISTOR,VARIABLE,COMPOSITION,100K,10 PCT,2W /POLARAD PART NO. 517923	RV4NAXSD104A	AU	1
R1106 THRU R1114	NOT USED			
R1115	RESISTOR,COMPOSITION,18K,10 PCT,1W	RC32GF183K	AU	1
R1116	NOT USED			
R1117	RESISTOR,COMPOSITION,82K,10 PCT,2W	RC42GF823K	AU	1
R1118	NOT USED			
R1119	SAME AS R1105			
R1120	RESISTOR,VARIABLE,WW,100K,5 PCT,12W	BK5413	BE	1
R1121	RESISTOR,COMPOSITION,270K,10 PCT,1W	RC32GF274K	AU	1
R1122	NOT USED			
R1123	RESISTOR,COMPOSITION,100K,10 PCT,1W	RC32GF104K	AU	1
TB1101	TERMINAL BOARD ASSY	CP23611	BE	1
V1101	ELECTRON TUBE,KLYSTRON /POLARAD PART NO. BK5014	5721	BH	2
V1102	ELECTRON TUBE	6X4	CK	2
W1101	PROBE AND CABLE ASSY,PART OF A1102	B15655	BE	1
W1102	WAVEGUIDE ADAPTER ASSY	B146207	BE	1
W1103	CABLE ASSY	B146350	BE	1

TABLE 6-2. PARTS LIST (CON'T)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
W1104	WAVEGUIDE ADAPTER ASSY	B146208	BE	1
XDS1101 AND XDS1102	LAMPHOLDER,BAYONET SOCKET /POLARAD PART NO. 005246	7-08	V	1
Y1101	OSCILLATOR ASSY,LESS V1101	CP20512	BE	1

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CONSULTANTS — DESIGNERS — MANUFACTURERS
43-20 34th Street Long Island City 1, N. Y.
EXeter 2-4500

REQUEST FOR MAINTENANCE

FROM:

COMPANY NAME _____ DATE: _____

ADDRESS: _____ INDIVIDUAL _____

_____ POSITION _____

SECTION OR DIVISION _____ PHONE NO. _____ EXT. _____

_____

EQUIPMENT _____ DATE OF PURCHASE _____

MODEL _____ SERIAL NO. _____ ORDER NO. _____

_____

TROUBLE REPORT:

A. Description of trouble _____

_____

_____

_____

_____

_____

B. Has trouble been localized? _____ If so, how and where: _____

_____

_____

_____

_____

_____

C. Instruments used and measurements taken, if any: _____

_____

_____

_____

D. Is trouble intermittent? _____

E. Hours of operation prior to this trouble _____

F. Date trouble occurred _____

G. Was factory consulted by telephone or letter prior to this request? _____

If so, give date and person to whom directed: _____

_____

H. Additional Comments: _____

_____

_____

_____

_____

_____

_____

When trouble develops requiring factory assistance, complete this form and send to:

Polarad Electronics Corporation
43-20 34th Street
Long Island City 1, New York
ATTENTION: Service Department

After this report has been analyzed by the Service Department, you will be notified when a field service engineer will call on you to make the necessary repairs. If your trouble can best be corrected at the factory, we will so notify you with instructions and authorization for returning the equipment.

NO EQUIPMENT MAY BE RETURNED TO THE FACTORY WITHOUT WRITTEN AUTHORIZATION

POLARAD
PROVEN RELIABILITY

POLARAD ELECTRONICS CORPORATION

43-20 34th Street
Long Island City 1, New York

World Leader in Microwave Instrumentation

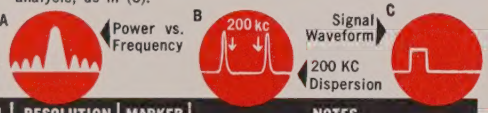
SPECTRUM ANALYZERS—10-100,000 MC

Undisputed leader in the field of microwave spectrum analysis, Polarad offers the widest, most diversified line of equipments for precise and meaningful quantitative and qualitative evaluation of any signal, regardless of complexity or frequency content. The features listed below are generally common to all Polarad Spectrum Analyzers:

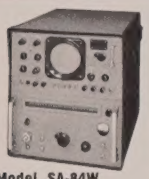
- Direct-reading UNIDIAL® tuning —no klystron mode-setting!
- Frequency Dial Accuracy, ±1%
- Sweep-rate adjustable, 1-30 cps
- Non-contacting klystron-cavity chokes for noiseless tuning, optimum stability
- Five-inch flat-face CRT display
- Compatible with Multi-pulse Spectrum Selector SD-1

Model TSA-S
Dual-Purpose Spectrum Analyzer/ Synchroscope

TSA SERIES. 10-44,000 MC in 5 plug-in tuning units. Model TSA provides power vs. freq. display (A), below. Model TSA-S provides both (A) and synchroscope display (B). Wide-dispersion Model TSA-W provides (A) display, up to 80 MC (full screen), down to 60 KC for wide pulse analysis, as in (C).



MODEL	DISPERSION	RESOLUTION	MARKER	NOTES
TSA	25 KC-25 MC	1-80 KC	±14 MC	Sensitivity —50 to —100 dbm
TSA-S	400 KC-25 MC	5/50/500 KC and 5 MC	±14 MC	Sensitivity —50 to —100 dbm. Synch. Sweep Rates: 2 μsec to 0.1 sec/cm
TSA-W	25 KC-80 MC	1-80 KC	±40 MC	Sensitivity —50 to —100 dbm Displays spectra of 0.1 μsec pulses

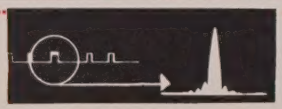


Model SA-84W
Wide-Band Spectrum Analyzer

Model SA-84T
Transistorized Portable

SA SERIES Universal Spectrum Analyzers provide complete coverage from 10-40,880 MC in compact, self-contained form. The new lightweight transistorized unit Model SA-84T is truly portable, and will operate from either the AC line or 12 V DC. The SA-84W wide-band design features exceptionally broad frequency coverage and very wide dispersion in a single-unit package.

MODEL	DESCRIPTION	DISPERSION	RESOLUTION	NOTES
SA-84T	Transistorized Universal	400 KC-25 MC adjustable	20 KC	Internal Marker, ±13 MC Sensitivity, —50 to —105 dbm.
SA-84	Standard Universal	500 KC- 5 MC (up to 55 MC) 500 KC-25 MC (above 55 MC) } adj.	20 KC	Variable Internal Marker comparable sensitivity to SA-84T
SA-84W	Wide-Dispersion Universal	25 KC-10 MC 25 KC-80 MC 240 to 40,880 MC	1-80 KC variable	Crystal-controlled markers over entire freq. range. Log-linear display. Accurate IF attenuator. Comparable sensitivity to SA-84T



MULTI-PULSE SPECTRUM SELECTOR: When used with any Polarad Spectrum Analyzer, this instrument permits isolation and spectrum analysis of any individual pulse in a complex coded signal.

Model SD-1

MODEL DA-70, 50-100 KMC Spectrum Analyzer. Dispersion adj. 50-1000 MC. Resolution 1 MC. High IF assures image rejection, prevents video detection. Sensitivity, —50 dbm, nom. Frequency marker for △F measurements.

MODEL WSA Wide-Band Spectrum Analyzer. 10-40,000 MC in 20 push-button-selected bands. Narrow mode: 1-25 MC dispersion, 20 KC resolution. Wide mode: 50-4,000 MC dispersion, 1.5 MC resolution. Freq. marker to 4 KMC. End-markers indicate band limits. Center-marker for wide-to-narrow switching without signal loss.

Model WSA

USE THIS CARD for complete specifications or call your local Polarad representative (see the Yellow Pages).

SIGNAL GENERATORS—0.5-50 KMC

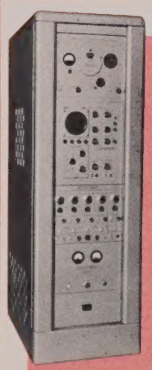
Model PMR
UHF Signal Generator

MSG-2R
Signal Generator

Model MSG-34
Ultra-Broadband Signal Generator

500-11,000 MC SERIES. These superb instruments incorporate every important mechanical and electronic advancement known to the art, including several Polarad exclusives, such as UNIDIAL® tuning. Direct-reading frequency dials, accurate to ±1%. High-stability non-contacting klystron-cavity shorts for noiseless tuning, permanent accuracy. Continuously-variable, directly-calibrated attenuators. Modulation: internal pulse, FM, sq-wave; external pulse and multi-pulse. Delayed and undelayed sync. outputs. The Model PMR provides exceptional FM capability through the use of a special plug-in modulator (supplied).

MODEL	FREQUENCY-KMC	CALIBRATED POWER OUTPUT	INTERNAL MODULATION
PMR	0.5 - 1.0	0.5 MW (—3 dbm) to —127 dbm	sq-wave, 40-4,000 pps } FM with plug-in Pulse, 10-10,000 pps } modulator
KSS (Signal Source)	1.05-11.0 (4 plug-ins)	Uncalibrated. Power Output: 14-400 MW, depending on freq.	sq-wave, 10-10,000 pps (external pulse, sq-wave, FM)
PMX	4.45-11.0 (2 plug-ins)	1 MW (0 dbm) to —127 dbm	All instruments in this group: pulse modulation: 10-10,000 pps. *pulse width: 0.2-10 μsec, pulse delay: 2-2,000 μsec. square-wave modulation: 10-10,000 pps. FM deviation: ±2.5 MC min. *0.3-10 μsec. in MSG-1R and 2R.
MSG-34 (Ultra Broadband)	4.2 -11.0 digital freq. indicator	1 MW (0 dbm) to —127 dbm	
MSG-1R	0.95- 2.40	1 MW (0 dbm) to —127 dbm	
MSG-2R	2.0 - 4.60	1 MW (0 dbm) to —127 dbm	



MULTI-PULSE CODE-MODULATED MICROWAVE SIGNAL GENERATOR

Model B — 0.95 to 10.75 KMC 4 plug-in tuning units. 5 independent adjustable channels, each with variable pulse width and delay. Built-in precision scope.

EHF SERIES Signal Generators (frequency and power calibrated) and Signal Sources (frequency calibrated) operate CW, with 1 KC int. modulation, or ext. mod'n. See chart for tuning unit ranges and designations. Also available: SG-1218 Generator or SS-1218 Source, 12.4-17.5 KMC.

EHF Series
Signal Generators

EHF SIGNAL GENERATOR Tuning Unit	Frequency Range	EHF SIGNAL SOURCE Tuning Unit
G1822-1	18,000 to 22,000 mc	S1822-1
G2225-1	22,000 to 25,000 mc	S2225-1
G2427-1	24,700 to 27,500 mc	S2427-1
G2730-1	27,270 to 30,000 mc	S2730-1
G3033-1	29,700 to 33,520 mc	S2933-1
G3336-1	33,520 to 36,250 mc	S3336-1
G3540-1	35,100 to 39,700 mc	S3540-1
	39,600 to 46,000 mc	S4046-1
	45,900 to 50,000 mc	S4650-1

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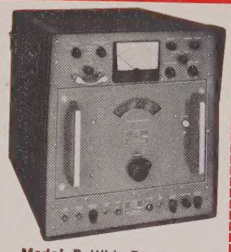
43-20 34th Street
Long Island City 1, New York

World Leader in Microwave Instrumentation

MICROWAVE RECEIVERS & FIELD INTENSITY METERS, 0.4—84.2 KMC

Polarad, pioneer in microwave receiver development, offers the industry's most complete and diversified line of precisely-calibrated, wide-range receivers and radio-interference-and-field-intensity(RI/FI)meters. The new transistorized portables feature built-in inverters for optional 12 VDC operation. **Only Polarad** offers **both** calibration techniques: Integral signal generator (Model FIM-2) for wide-range, absolute level calibration **or** (Model CFI) integral impulse generator for simplicity, convenience. All units have audio, video, and recorder outputs. All display output directly in db.

Model CFI Portable Transistorized Calibrated RI/FI — Meter/Receiver



Model R Wide-Range Multipurpose Microwave Receiver

Model FIM-2 Absolute-Calibrated RI/FI—Meter/Receiver

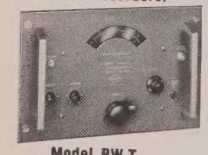
Model TR Transistorized Portable Wide-Range Multipurpose Receiver

Both the CFI and FIM-2 have Category A Air-Force Approval Per MIL-I-26600 and MIL-I-6181

MODEL	DESCRIPTION	FREQUENCY RANGE	MINIMUM SENSITIVITY ⑥	SELECTIVITY & TUNING (see notes below)	CHARACTERISTICS
CFI	TRANSISTORIZED CALIBRATED RI/FI METER/RECEIVER (Category A AF approved)	1-10 KMC (0.95-11.26 as receiver)	—90 to —84 dbm	① ② ③ ④	• **Digital** frequency dial • AM, FM, CW, Pulse reception • AFC, AGC (60 db linearity range!) • Calibrated antenna system includes both omni (broad-band) and directionals for each range. • Attenuation: 0-80 db in 1 db steps • Front panel metering of average, peak, slide-back peak, or quasi-peak RF level.
FIM-2	CALIBRATED RI/FI METER/RECEIVER (Category A AF approved)	1-10 KMC Check Polarad for 21 KMC Coverage.	—81 dbm	① ② ③ ④	• Single UNIDIAL® tunes both receiver and signal generator. • First system to determine radiated RF interference and susceptibility.
TR	TRANSISTORIZED MICROWAVE RECEIVER	0.95-11.26 KMC	—90 dbm	① ③ ④ ⑤	• AFC, AGC circuits. • **Digital** frequency dial • AFC, AGC (60 db linearity range!) These versatile precision devices are really **four instruments in one:** • AM, FM, CW, MCW, Pulse Receiver. • Field-intensity receiver. • Pulse, pulse-time position demodulator. • Sensitive power meter.
R	ULTRA-WIDE-BAND MICROWAVE RECEIVER	0.4-84.2 KMC	—85 to —50 dbm	② ③ ⑤	• UNIDIAL® direct-reading freq. control • AFC, AGC (60 db linearity range!)

① Impulse Bandwidth: 1, 5, or 8 mc (Model FIM-2, 5MC only).
② Image and Spurious Response Rejection: better than 60 db. (up to 11.26 KMC in Model R)
③ Four plug-in tuning units cover entire range (Model R uses 9) and all are direct-reading, calibrated to ±1%.
④ Maximum RF input, 3 Volts.
⑤ Video bandwidth: 3.5 MC (Model TR) 2 MC (Model R)
⑥ Depending upon frequency.

ANTENNA PATTERN TUNING UNIT 2-75 KMC: Used with Model R receiver. External Mixer with flexible cable. Locate up to 75 ft. from receiver, at or near antenna. Internal 1 KC sweep — compatible with all standard AC recorders.



Model RW-T

CALIBRATED ANTENNAS
1,000 to 10,000 MC

TEST ANTENNAS
1,000 to 40,000 MC

TRANSISTORIZED IMPULSE GENERATOR Model IC-120: 1 MC-10 KMC. Calibrates microwave receivers for RI/FI work. Signal source for spectrum analyzers. Generates 0.02 nanosec. pulses.

ALL-CERAMIC REFLEX KLYSTRONS Maximum resistance to shock, vibration, temperature extremes. Guaranteed operation to 250°C, without cooling. Stable, low noise, low microphonics. (X series has guaranteed minimum 200 mw output.) Request complete application data.

TYPE	FREQ. RANGE—KMC	RETMA
ZV1012	0.5 - 3.0	7506
ZV1010	0.7 - 3.0	7505
ZV1010X	0.95- 2.8	——
ZV1021	1.0 - 4.0	——
ZV1021X	1.0 - 4.0	——
ZV1009	1.5 - 6.0	7049
ZV1009X	1.7 - 5.0	——
ZV1011	4.0 -11.0	8052

SPECIAL INSTRUMENTATION for MICROWAVE DEVELOPMENT, PRODUCTION, CHECKOUT.

Condensed listing of precision instruments developed by Polarad to meet a wide range of requirements.

Model MP-1A
Five-Channel Coded Multipulse Generator

CODED MULTI-PULSE GENERATOR. Model MP-1A. Five independently adjustable channels generate coded multipulse trains. Permits independent external PTM of each channel. 10-10,000 cps group rep-rate, each pulse adj. 0.2-2 μsec. Delay, 0-300 μsec.

PULSE JITTER TESTER. Model PJ-1. Measures and displays magnitude and waveform of:
Relative jitter: 5/10/100 nanosec. full scale
Pulse-width jitter: 5/10/100 nanosec. full scale
Rep-rate jitter: 5/10/100 nanosec, 1/10/100 μsec. full scale

MICROWAVE TUBE TESTER. Model K-200. Simple as conventional tube tester, monitors cathode, anode, grid, reflector voltages and currents, checks shorts, fil. continuity. Tests klystrons (internal/external-cavity) pencil triodes, rocket and lighthouse tubes.

PRECISION NOISE GENERATOR. Model N-1. 1KC-500MC source for direct measurement of noise figure (1-20 db, accurate to ±0.25 db) of VT and transistor circuits.

TRANSISTORIZED MICROWAVE POWER METER. Model P-3. Measures absolute power instantly, directly, 10-40,000 MC with 5 interchangeable thermistor mounts. 0.01 MW full scale sensitivity! Line or battery operated, only 6 lbs.

BG-678

I would like more information and specifications on: (circle)

SPECTRUM ANALYZERS
TSA, TSA-S, TSA-W, SA-84, SA-84T, SA-84W, DA-70, WSA, SD-1

SIGNAL GENERATORS
PMR, MSG-34, PMX, MSG-1R, MSG-2R, EHF, KSS B

RECEIVERS and RI/FI METERS
R, TR, ANTENNAS, RW-T, FIM-2, CFI, IC-120

LABORATORY EQUIPMENT
PJ-1, N-1, P-3, KLYSTRONS, MP-1A, K-200

Name.....Title.....

Dept. or Station.....Company.....

Address.....

City.....Zone.....State.....

My major fields of interest and activity are:.....

.....

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